THE MAKING OF AN EXECUTIVE

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H. L. Carman
1930

The Making of an Executive

BOOK II

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INDUSTRIAL ECONOMIST

THE MAKING OF AN EXECUTIVE
Parts 4–6

8C
Published by
INTERNATIONAL TEXTBOOK COMPANY
SCRANTON, PA.

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General Summary of the Contents of Three Books Entitled

THE MAKING OF AN EXECUTIVE

BOOK I

Requirements of an Executive

The executive viewpoint; Personal qualifications; Special knowledge required by the executive; Office activities, organization, layout, and control; Material—its specification, requisition, purchase, inspection, storage, issue, handling, and control; The factory, its activities and special reports; Marketing the product; The human element in business; Promotion of quality of production; Finance; Development work.

The New Tools of Management

Graphic representation; Analysis to secure economy; Principles of layout; Visual control; Mechanical aids.

The Executive and the Office

Relations with public; Layout of an office organization; Layout of order routine; Special divisions of office routine; Physical layout of office; Executive control of office transactions.

BOOK II

Purchasing and Storekeeping

The executive and his relation to materials; Function of the technical department; Principles controlling purchasing; Routine of purchasing department; Principles controlling storekeeping; Layout and arrangement of stores; Routine of storekeeping; Some special varieties of storekeeping; Labor saving in handling material; Executive control of purchasing and storekeeping.

The Executive and the Factory

Nature of factory operations; Design; Equipment; Operation; Control; Comparison, the watching function; Relations of the executive with the factory.

Marketing the Product

The product and the field; Methods of influencing the consumer; Advertising; Salesmen; Considering a project; Organization of a sales department; The executive and control of sales.

BOOK III

Employment, Welfare, and Labor

Labor turnover; Labor environment; Job analysis and labor specification; Engaging and training the worker; Cooperation of labor in administration; The executive and wage rates; Reports to the executive.

Promotion of Quality and Quantity

Perfecting processes and routine; Correlating results and reward; Instruction and experiment.

The Executive and Finance

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Reconstruction, Betterment, and Planning

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THE MAKING OF AN EXECUTIVE

(PART 4)

Serial 1988D Edition 1

PURCHASING AND STOREKEEPING

THE EXECUTIVE IN HIS RELATION TO MATERIALS

1. Material the Basis of Commerce.—Practically all business deals in material of one kind or another. The principal exceptions are insurance companies, financial institutions (banks and trust companies), and engineering and other professional organizations which sell services and not concrete articles. Purely mercantile businesses (commission merchants) buy and sell material without doing work on it, but all manufacturing concerns deal with material in a number of successive stages. Manufacturing, being the most complex of all transactions in the course of which material is bought and sold, practically includes all other modes of commercially dealing with materials. Any person thoroughly conversant with the handling of materials in manufacture will be competent to handle them also in almost any circumstances.

2. Raw Material.—Manufacturing is, in general, a process by which raw material has work done upon it and is thereby converted into a new class of article, technically termed *finished stock*. But the term raw material is a very elastic one. It must not be considered to mean material in a crude state only. Pig iron or steel billets are raw material in

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some industries, but screws, bolts, stampings, and castings of all kinds, angle and shaped metal, woven cloth, wire mesh, or gear-wheels may be the raw materials of others. Such material may even be quite complex articles such as electric motors, switches, and controllers, valves, clutches, and other mechanisms. The raw material of an industry is simply the material as it *first enters* that industry.

3. Distinction Between Stores and Stock.—For the purpose of avoiding confusion it is usual to make an arbitrary distinction between certain classes of material in its progress through the business. Material as purchased is called *stores*. Material that has passed through the factory and has been worked on, is called, when it becomes salable, *stock*. In some kinds of business there is a third classification, intermediate between stores and stock, namely, material which has been worked on but is not yet in salable form. Such material is called *part-finished product*. It enters into consideration only when parts are made in quantities and then put on one side for incorporation at some future date into salable product.

1. Stores are kept in a storeroom by a storekeeper.
2. Stock is kept in a stock room by a stock keeper.
3. Part-finished goods are usually treated as stores.

Another distinction to keep in mind is:

1. Stores are purchased, and are issued to the factory for use.
2. Stock is made by the factory, and is sold to customers.
3. Part-finished goods are made by the factory, and held in storeroom till again wanted by factory.

4. Scope of Current Section.—In this Section the question of material will be dealt with only up to a certain point. The special subject for study here will be how a demand for material arises, what steps are taken to satisfy it, whence the material comes, what is done with it on arrival, and how it is issued to the production departments. Beyond the point where it leaves the possession of the storekeeper the course of material will not here be followed.

5. Executive's Relation to Material.—In businesses of any considerable size the executive does not come into personal relation with material at any stage. The transactions are so numerous and important that it is usual to split up the responsibility for material into several sections, each in charge of a special man. The executive must have a clear understanding of each man's sphere of action, and he must further develop a system of control by statistics and charts which will enable him to satisfy himself at any moment that affairs are in a normal condition. He must also have a grasp of the essential purpose to be served by the various activities which are set up to deal with material in its various stages. Each of these divisions has a separate efficiency of its own.

6. Several Aspects of the Materials Situation. There are three main aspects under which materials have to be considered. First, as regards the origin and specification of the demand; second, as regards the work of ordering and procuring what is wanted; and third, as regards taking care of material when it arrives, and holding it until needed by the factory. These three aspects represent three activities of entirely different character. It is the task of the executive so to plan that the efficiency of each of these activities is made a matter of separate responsibility, and that all concerned work together harmoniously in their common work of keeping material moving in a steady and uninterrupted stream through the plant.

The *origins* of demand are (*a*) the department that ascertains what special material is wanted on each order, usually called the planning department; (*b*) the storekeeper, who finds that certain items in his stores are falling below a fixed minimum.

Specification of the demand is usually made by a technical department if the article is not a standard commercial one.

Selection of the supply firm, and *ordering*, are the work of a purchasing agent.

Acceptance and care of the material on arrival is the work of the storekeeper.

FUNCTION OF THE TECHNICAL DEPARTMENT

7. Specification by the Technical Department. The nature of the technical department will vary according to the business. Usually either engineering or chemical experts, or both, are involved. Specifications will contain detailed instructions to the purchasing agent and to the bidder as to what is wanted, and very frequently as to the tests which will be applied on arrival of the goods, and which the goods must pass successfully. Such specifications may deal either with material destined to become part of the finished product, and may then cover such points as composition, tensile strength, hardness, etc. of steel or iron castings, the strength and purity of dyes or drugs, the quality of leather, the weave and strength of cloth, and so forth; or they may deal with supplies, such as oils, varnishes, greases, tools, taps and dies, gauges, and similar items. Specifications will sometimes indicate special makes of articles, but as a rule are confined to specifying qualities, leaving the question of quantity, price, and firm to the judgment of the purchasing agent. Whenever possible specification of qualities and properties should be accompanied by an indication of definite tests by which the purchased article will be judged.

8. Object of Technical Specification.—Nearly all kinds of material may be found in very varying quality on the market. The different qualities cannot, in many cases, be distinguished by mere inspection, even by a man familiar with such material. A substance like rubber, for example, may vary from ten to eighty per cent. of the genuine article, being subject to adulteration not only with chemicals, but also with substitutes exceedingly close in chemical composition to natural rubber. In such cases a number of technical tests, both chemical and mechanical, are necessary if any particular quality of rubber is called for by manufacturing exigencies. Moreover, when simple tests for an article in general demand are well known, it is a not uncommon practice for suppliers to study how to circumvent the test. The lactometer test for milk, for

example, which should show the richness of the butter fat contained, depends on specific gravity, and can be evaded by withdrawing some of the cream and adding some loading substance that restores to the mixture the specific gravity demanded. The first object of technical specification is, therefore, to provide a mechanism for insuring that the firm is getting exactly what it wants and has paid for.

9. Fitting the Material to the Job.—Another function of the technical department is to consider which, among a range of grades of a given substance, is best suited for the purpose in view, due regard being given to relative costliness. Thus if a special kind of varnish is needed to fulfil certain exacting working conditions in the finished product, it is obvious that neither price nor quality *alone* can decide the selection. It is not necessarily either the best or the cheapest grade that is wanted, but the cheapest grade which will just give complete satisfaction. In such cases a compromise must be made between two extremes: using the best may mean wasting money on qualities that are of no service: using the cheapest may mean falling short of certain indispensable qualities. In practice, especially in large plants, enormous economies have resulted from the technical study of quality in supplies. Even in the case of comparatively small firms, that cannot afford to employ a chemist or other expert regularly, it is often of great advantage to arrange for consulting service in preparing specifications for the material bought in very large quantities.

PRINCIPLES CONTROLLING PURCHASING

10. Purchasing and Storekeeping.—Purchasing and storekeeping are two fundamentally different functions, one dealing with the procuring of goods and the other with their acceptance and care on arrival. In some cases these two functions are handled independently. In others the purchasing agent is considered as the head and the storekeeper as his subordinate. In large plants the former arrangement is often found, but in smaller ones, where only one good man can be

afforded, the purchasing agent takes charge of the whole routine and is responsible for the purchase, storage, and issue of all material. The two functions are not only different, but they call for different qualifications. Purchasing involves a much wider range of action and heavier responsibility than storekeeping, inasmuch as it is the branch that exercises a considerable degree of initiative, while storekeeping is capable of being reduced to mechanical routine requiring only ordinary intelligence to keep in due motion. In proportion as the material dealt in is subject to sudden or wide market fluctuations, either in price or supply available, the function of purchasing requires higher qualifications. The skill or experience required to buy steel or silk in the open market is obviously greater than that necessary to secure stocks of lead pencils or typewriter supplies. Purchasing unassisted by technical specification also requires greater shrewdness and wariness than when such assistance is obtainable.

11. Service.—It will be readily understood that the combined work of these two departments, purchasing and storekeeping, is a service. It exists for the purpose, of meeting, in the most exact and economical way, the needs of other departments. Its duty toward the general executive is economical purchase and as low a total investment as is possible under the circumstances. Its duty toward the productive departments is to bring forward the due quantity and quality of material asked for, at the time it is wanted. Purchasing therefore must always be ahead of demand, and the storeroom is the place where material rests between the time of its arrival and acceptance and its issue to the productive departments. Every official of the purchasing and storekeeping departments should be impressed with the idea that he exists for the rendering of prompt and efficient service, and that he will be valued by the executive in proportion as the flow of material is smooth, punctual, and uninterrupted. Each man should feel that whenever anything is wanted it is his task to provide it, or to offer the nearest substitute. It is the executive's task to try to cultivate this spirit.

12. Routine of Purchasing-Storekeeping.—The diagram, Fig. 1, shows graphically the relation of the various functions thus far mentioned. First the purchasing agent receives a requisition or advice that material will shortly be required. The origins of this demand will be considered later. After receiving bids (with or without specification) he issues his order. The supply firm in due course ships the goods. On arrival these are received by the storekeeper, who examines them to make certain that they are in conformity with the order. He may, or may not, be assisted in this examination by

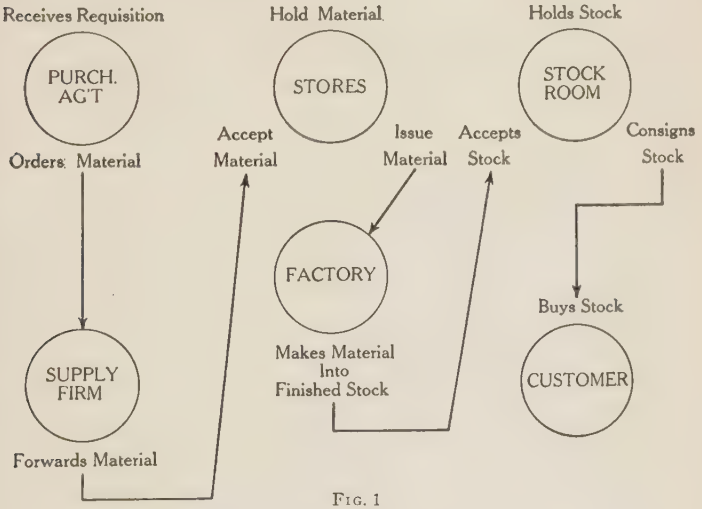

FIG. 1

the technical department. If the goods are satisfactory, he accepts them, and holds them in the storeroom until wanted. On demand he issues them in such quantities and at such times as indicated by the productive department. The productive department (called the factory in the diagram) works on them and transforms them into finished product. They are then delivered to the stock room, and on being accepted by the stock keeper are held until sold. Upon instructions received from the sales department the stock keeper consigns the goods to the customer, thus ending the cycle of operations. As will

be seen later this is only a very bald outline of what really happens, but the general aspect of the cycle should be firmly fixed in memory at this stage. The circulation of material in the factory and the stock room will be dealt with elsewhere.

13. Necessity for Centralized Purchasing.—The importance of having all purchasing under one hand is now generally recognized. Formerly it was a common practice for each department, and in some cases each foreman, to do their own buying, the theory being that, as each man was responsible for product, he should be allowed a free hand in choosing the material he required. In many institutions, notably in universities, municipalities, and other public undertakings, several independent purchasing authorities may yet be found. But in commercial houses, where efficiency is a factor of competitive strength, this practice is generally abandoned. The reasons for centralizing purchase are principally these: (*a*) the larger the quantities to be bought, the more favorably can they be purchased; (*b*) more detailed judgment can be brought to bear on what is really required; (*c*) the larger the quantities to be purchased, the better it will pay to employ technical advice as to specification; (*d*) purchasing is a skilled and specialized craft, and is best undertaken by a man who gives his whole time to its problems; (*e*) centralization of purchasing, especially when accompanied by technical specification, diminishes the chances of graft.

14. Three Factors of Success in Purchasing.—Purchasing is by no means an easy thing to do successfully. The picture of a purchasing agent as a man who performs his work by writing or telephoning for bids and signing his name at the foot of blanks is by no means a complete one. To attain success an agent must continually wrestle with three mutually opposing factors, and his success will depend on the manner in which he reconciles these oppositions. From the viewpoint of the general executive that purchasing department is most successfully run which:

1. Maintains the current stocks of material as low as possible.

2. Does its buying on the most favorable terms.

3. Keeps the productive departments supplied, with the minimum of delay.

It will be noticed that these three factors of successful purchasing are, in a measure, mutually opposed. It is easy to eliminate delay by accumulating large quantities of material. It is easy to shop closely as regards price, neglecting the importance of prompt delivery, or the necessity for keeping stocks low; it is also easy to keep stocks low while waiting for opportunities to buy cheaply, and while serious loss is being incurred in the productive departments for lack of material. Price reduction is not necessarily good if it involves increasing delay or quantity to be stored. Reducing quantity may be bad if it involves either higher price or increased delay. Less danger of delay may be dearly purchased if an unduly high price or too large a quantity on hand is thereby implied.

15. Time as a Factor in Purchasing.—It will be seen that in two out of three of the factors of success in purchasing time plays a prominent part. The objection to large stocks of material is that capital, which has to earn interest, is thereby locked up. Not only is capital locked up in the actual goods purchased but also in the storage space and the (often expensive) fittings and tackle required for storage. The whole success of business depends on rapid turnover of capital. The objection to large stocks of material is therefore an obvious one. The question of time also enters into, and is indeed the whole substance of, the third factor: the plant must not be kept waiting. In proportion as the productive departments are organized on modern lines, with exhaustive planning and scheduling of operations in advance, the imperative importance of material being on hand when wanted becomes more and more manifest. To upset the program of the shops for the sake of a small advantage in price is a grave error, causing a loss perhaps fifty times in excess of the amount economized. It is essential, therefore, that the purchasing department should never forget the principle that it exists not for itself but for others. If its peculiar professional virtue is to shop at close

price, it must never forget that the exercise of this virtue can become a vice if it leads to impairment of the efficiency of the total service rendered.

16. Seasonal Demands for Material.—In some classes of business the problem of purchasing is further complicated by a demand fluctuating according to season. A plant may be making one line of goods in summer for next winter's use, and another line in winter for the following summer. Frequently, though not always, these seasonal demands come very close to the period of actual consumption. An unexpected demand may then require very large output at short notice. The reverse may also happen; a bad season (from the trade viewpoint) may cause an unexpected slackening of demand. Things like straw hats, raincoats, rubber shoes, umbrellas, and so forth are obviously dependent for their demand on the weather, that is, on conditions which cannot be foreseen. Purchasing of raw material under such conditions is a matter much affected by the policy of the firm. The extent of the purchasing agent's activities will depend not so much on his own judgment, as on the instructions received from the executive, who will give such instructions after anxious consideration of all the circumstances, consultation with salesmen, and so forth. In other words, the question of purchase is ruled here not only by the market for raw materials, but by the probable condition of the selling market.

17. Executive's Part in the Purchasing Problem. It will have been gathered from the foregoing that the degree of complexity of the purchasing function varies not only with the size of a business, but also with its nature. It may be of a very simple character, mainly confined to filling definite requisitions for ordinary standard or staple commercial articles in specified quantity and grade. It may, again, where fluctuating material markets are involved, depend not so much on the known and visible needs of the productive departments, as on a skilful forecast of probable future needs in a rising or falling market. Large stocks of material may be contracted for when a favorable market exists, or on the other hand a falling mar-

ket may dictate hand-to-mouth purchasing even to the extent of running very close to the margin of safety as regards hindering the operations of the productive departments. In a third case, purchase of material must be controlled by considerations of probable demand for finished product in a seasonal market, and this is the greatest difficulty of all. In planning a purchasing organization the executive should therefore carefully consider how his particular business comes under one or other of these classifications, and extend or restrict the scope of the department's responsibilities accordingly.

ROUTINE OF PURCHASING DEPARTMENT

18. Relations of the Purchasing Agent.—Since the responsibility for the work of the department rests on the purchasing agent as an individual, it will be well to begin by con-

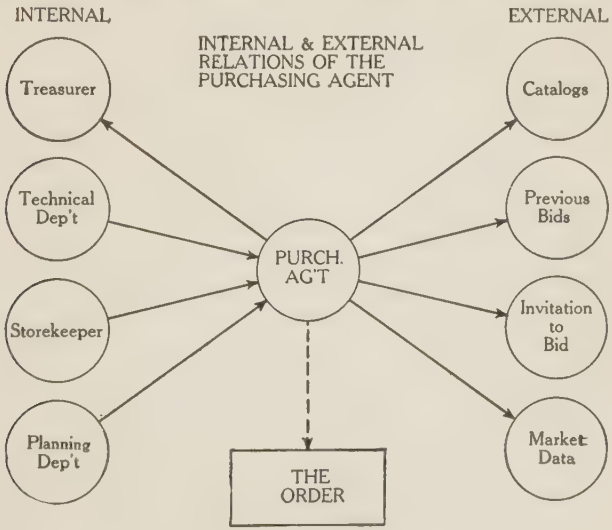

FIG. 2

sidering his internal relation to other departments and his external relation to the data on the basis of which he must form a judgment leading up to the placing of an order. In Fig. 2,

these relations are exhibited diagrammatically. At the head of internal relations those with the treasurer or other representative of the higher executive will be found indicated. As the purchasing agent is one of the largest, and sometimes much the largest disburser of money (in the shape of credit taken or incurred) of the whole organization, the necessity of close touch with the treasurer will be obvious. The necessity of consultation with the general executive in the case of seasonal demand has already been dwelt upon. With these exceptions the relations of the purchasing agent with other departments refer wholly either to a demand, or, as it is termed, a requisition, for material, or to the necessary specification of quality and grade already mentioned.

19. Origins of Demand.—As the function of the technical department has already been discussed, there are left to be considered the two remaining relations on the left side of the diagram, viz., storekeeper and planning department. From one or other of these two originate all the demands for the purchase of raw material. Before anything is purchased it must be discovered that something is wanted. In practice this discovery takes place either in the stores, where the stock on hand of an article is found to be below the limit prescribed; or in the planning department, where, on going over the material necessary to carry out a customer's order, it is discovered that certain material necessary is not kept in the stores. In either case a demand arises, a requisition is made out indicating exactly what is required, and the quantity necessary, and this requisition is then forwarded to the purchasing agent for his action. The way in which the prescribed limits of quantities usually kept in stores are arrived at will be dealt with in a later Section. In the case of new material requisitioned by the planning department the services of the technical department may already have been called on to furnish a specification. Or, if he deems it necessary, the purchasing agent may call on these departments for such assistance before seeking bids.

20. Proceeding to Obtain Bids.—With or without a technical specification, the agent has now before him all the

data necessary for his work. As indicated by the diagram, he may obtain information as to price, delivery, packing, etc., from several sources. In the case of a standard article, catalogs with their customary price and discount sheets will give him all the information necessary. Where it is a case for close competition he may refer to his files for previous bids on the same or like material, or he may decide that the importance of the matter deserves that new bids shall be invited. The final element on the chart, *market data,* refers to those materials which have a daily market price, published either in the daily press or some special trade organ.

21. Deciding Between Bids.—Decision as to which of several bids to accept will depend on the purchasing agent's experience of the way in which the individual firms making the bids commonly do business. Other things equal, he will assign the order to that firm which has made the lowest price. But other things may not be equal. The agent may know from previous experience that the lowest bidder is notoriously liable to fail in keeping promises of delivery. If, therefore, time is short, he will pass by such a firm. Again, if his own firm, for one reason or another, is financially embarrassed at the moment, the fact that one competitor will be more indulgent as to terms of payment, or will give longer credit, may turn the scale in his favor. Other reasons may affect the decision, and it is a delicate part of the work of the purchasing agent to balance these fine points one against another, so that his own firm obtains the maximum of advantage from the deal.

22. The Order Not the Last Word in Purchasing. Purchasing, as an operation, does not by any means end with the signing and mailing of an order. The object of the department is not only to purchase, but to furnish or supply. Therefore, whether an order is for a single consignment or is in the nature of a contract for periodical deliveries over a stated period, it is necessary to keep close watch on the actual despatch of the goods by the shipper at the agreed dates, to remind and press him if he is behindhand, or even, in important cases, to remind him ahead that a delivery is shortly due;

and when notification has been received that the goods are on rail, it is further necessary to observe the date at which they may be expected, and to communicate with shipping or transportation companies if they do not appear on time. In the latter case it is usual in firms of considerable size, to turn the matter over to a traffic manager whose special duty is to follow up all questions of delay, damage, rebates, and claims with transportation agencies. Whether a traffic man is concerned or not, the work and responsibility of the purchasing department do not end until the goods are actually in possession of the storekeeper.

23. Need of Appropriate System.—With all the varying and opposed factors in his daily work that have been mentioned the purchasing agent will not get very far or make a great success of his business if he relies on his unaided memory and intelligence as guides in making his purchases. Nor, in the case of a large plant, will he be able to give personal attention to every item passing through his department. He will need first a proper delegation of duties; second, a well-kept up system of records; third, the use of graphic methods to make visible to all concerned the condition of business passing through, and to sum up the results in quickly appreciated form for the use of the executive. In particular he will require a very exact and thorough system of control and tracing, so that the exact position of the goods asked for on each requisition may be ascertained without any turning over of records and papers but can be seen, not only by members of the purchasing agent's own staff, but by other departments concerned, at any time. The general idea of such a control will be given in some detail later.

24. Delegation of Duties.—The subdivision of work in the purchasing agent's office will depend very largely on the volume of transactions, and perhaps on their number rather than on their value. Where the business is principally the arrangement of long-term contracts, as, for example, in a foundry, the purchasing agent will require but little assistance, for such matters will require his own personal attention in all

details. But where a large variety of articles are being ordered daily in comparatively small parcels, the work may be divided among assistants, each of whom will handle some special line with which he is best acquainted. Thus, for example, one man will undertake all electrical purchasing, another may be an expert on small tools, gauges, and precision material, or there may be cases where a man with a chemical training or an acquaintance with the intricacies of lumber and wood makes a desirable assistant. Beyond this kind of specialization, the usual clerical specialization will be maintained. The registration of requisitions, care of files of information, correspondence, watching for delays in consignment, and so forth will each be assigned to a special clerk. The order control will also be put in charge of specially appointed men.

25. Indexing of Information.—It should be the care of the executive to insist that all information in possession of the purchasing department is properly and adequately indexed. The information accumulated over a term of years with regard to the purchasing operations of a business is very valuable if available. Unfortunately it is not always available. Purchasing agents are apt to rely to too great an extent on their memories. This practice is undesirable because no one's memory is infallible; furthermore, it makes no provision for the event, inevitable sooner or later, when the purchasing agent has to be replaced; his successor then has nothing to guide him, since his predecessor's unrecorded knowledge can be of no assistance to him. It must be remembered that delay of orders more often arises from the absence of some minor item of material than from exhaustion of main stocks. The only way to keep track of the sources of supply of all items is by the accumulation of records, adequately indexed. Trade catalogs and price lists, and records of all bids, successful and unsuccessful, should be indexed, so that their contents do not form an uncharted wilderness.

26. Control of Requisitions, Orders, and Deliveries.—The importance of the question of time in all matters relating to the purchasing and supply of material has already

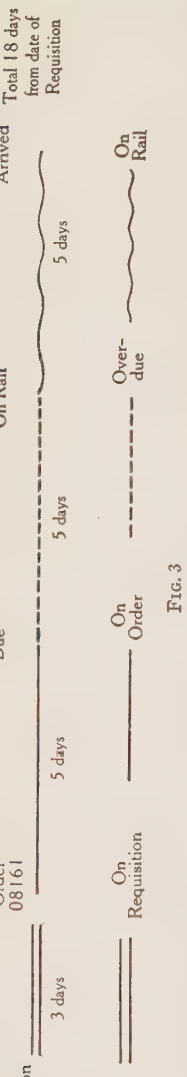

FIG. 3

been pointed out. It is advisable therefore to set up a mechanism by which the lapse of time on every requisition in its progress toward the stages of order and delivery can be seen at a glance. Such a mechanism is called a control board. Where work is divided among several assistant purchasing agents, each one should have a separate board. Where this is not the case, but the number of orders is nevertheless large, it may be well to subdivide the requisitions by classes, according to the nature of the business done. Thus, one board may be devoted to electrical purchases, another to castings and forgings, or to chemicals, oils, and varnishes, and so forth. Another arrangement, where orders are being distributed amongst several large jobbing firms, is to allot one board to each such firm. The principle of subdivision will, however, be clear, and the executive will prescribe such arrangement as is considered, after a careful review of the current requisitions, best to meet the actual circumstances.

27. Symbolizing Order Transactions.—The illustration, Fig. 3, shows the general principle on which the different stages of an order can be symbolized, not forgetting the time element. At the extreme left is placed the requisition number. Next, a double line extending three units to the right shows that the requisition was in the purchasing department 3 days before the order was actually issued. A single line of

five units bearing at the left the order number (08161) shows that delivery was stipulated in 5 days. A dotted line of five units shows that the order was not put in transit for 5 days after the stipulated date. Finally, a wavy line of five units indicates that 5 days were occupied in transit, making a total of 18 days between delivery and the original date of the requisition. In this diagram the whole story is told graphically in such manner that any one familiar with the symbols can read it at a glance, without the necessity of consulting books or turning over papers. In practice the story would be even clearer than the diagram shows, inasmuch as each stage would be represented by a single colored line, each stage having its own color for ready identification.

28. The Control Board.—The practical application of the principle of exhibiting the time taken by various stages of purchasing operations is shown in Fig. 4. The schedule is divided up by vertical lines into equal spaces, each of which indicates not only one day, but a particular day. If therefore an entry is started today, it is only necessary to keep on extending the lines each day in order to follow the progress of the operation and indicate day by day exactly what is the status of the order. In the example shown, it is assumed that today is February 1. It is seen at once that the first three requisitions (*B3171, B3172, B3173*) are already cleared up. The next one *B3174* was due yesterday and a reminder or urge note (symbolized by *R*) has been sent today. *B3175* has no stipulated time of delivery, but has been several days in transit, and is considered as overdue. Attention of the traffic manager has been called to this item. *B3176* has been overdue since the 27th. As it is wanted badly, an urge note was despatched on the 28th. As no advice of its being on rail has yet been received, another urge note has been sent out today.

29. Uses of the Control Board.—The value of the control board will not be understood unless its function of showing how each live order stands at the end of each day is grasped. Its importance does not lie in preserving a history

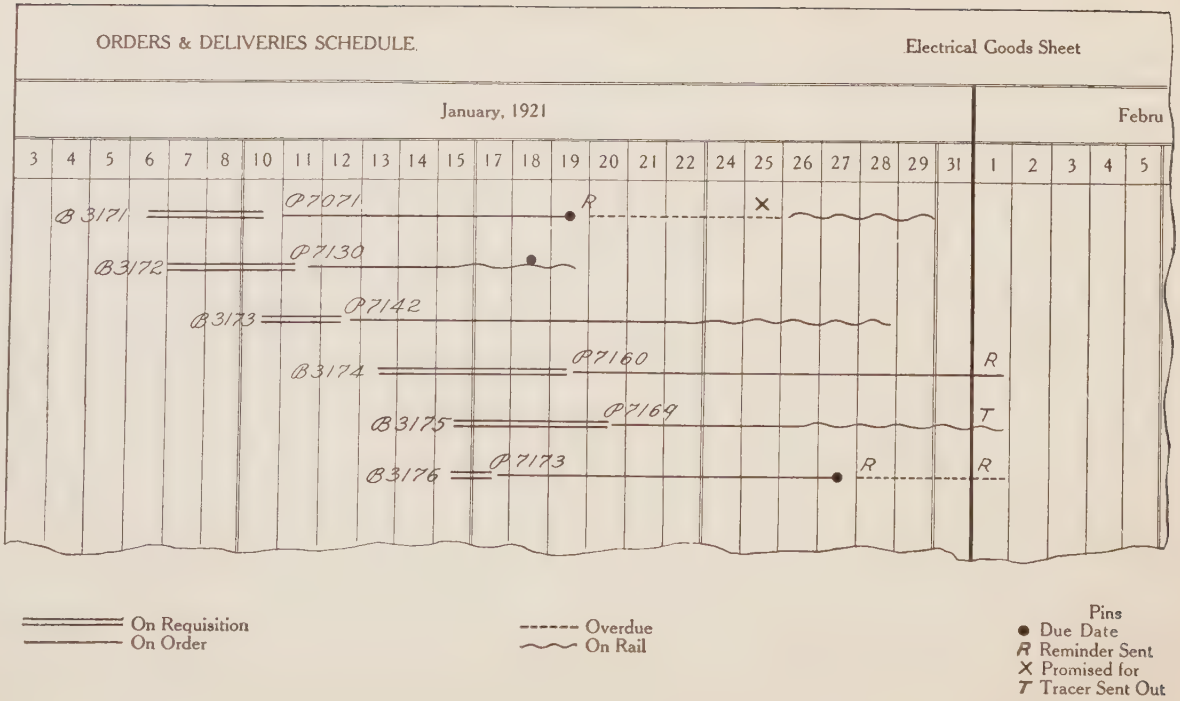
ORDERS & DELIVERIES SCHEDULE.
Electrical Goods Sheet
January, 1921
Febru
3 4 5 6 7 8 10 11 12 13 14 15 17 18 19 20 21 22 24 25 26 27 28 29 31 1 2 3 4 5
B 3171
P 7071
R
B 3172
P 7130
B 3173
P 7142
B 3174
P 7160
R
B 3175
P 7169
T
B 3176
P 7173
R
R
On Requisition
On Order
Overdue
On Rail
Pins
Due Date
R Reminder Sent
X Promised for
T Tracer Sent Out

FIG. 4

of the order, though even that is valuable. It is in relation to the current or live orders at any one moment that the assistance of the board is indispensable. If properly kept up to date (and it is worse than useless if this is not done) the board has a three-fold function, (*a*) it answers questions; (*b*) it indicates steps to be taken; (*c*) general deductions can be drawn from it.

30. Questions Answered by the Board.—The control board forms a public bulletin of purchasing operations. It may be open to any one's inspection because it discloses no information as to prices or terms, while it does disclose all information as to status, expectation of delivery, and steps taken to get delivery. Where such a board is in use, officials from other departments interested in the progress of orders can visit it daily and thus observe how each matter stands. If they are not satisfied with the progress made, they can urge attention to the facts. The board answers these questions: Is the article ordered yet? When is it promised for? Is it overdue, and how much? Has it been urged forward? Is it on rail, and how long has it been on the way? If too long, has a tracer been sent out? Has any promise been received since, and for what date? Is the article now in the stores? It will be seen that this list covers almost every possible question that can be legitimately asked, and without telephoning, writing notes, or disturbing any one to get the information desired.

31. Steps Indicated by the Board.—To the purchasing staff itself, the control board indicates each day exactly what steps should be taken with regard to each order. If a requisition has been overlooked, the lengthening line is in itself a silent monitor. If, for example, green be the color for unfilled requisitions (instead of the double line shown in the diagrams) the purchasing agent will not like to see any prominent amount of green on his sheet. Its appearance would indicate slackness in turning requisitions into orders. A visiting executive would be apt to ask unpleasant questions. Next the position of the large black pin representing due date is

important. If one of these appears in today's column, this indicates that it is time for a reminder to be sent to the supply firm. If the dotted line from an earlier column is found to be crossing today's this suggests consideration as to whether a second reminder should not be sent. If a cross appears in today's column, it shows that a promise has not been fulfilled, and something should be done. If a wavy line is found of several days length, it calls for consideration as to the desirability of putting the traffic manager in touch with the case. In all these ways positive suggestions are made to the control man, in a way that cannot be ignored except by gross neglect. And when the control man takes the steps desired, he indicates in his turn, by means of the appropriate pin, that such steps have been taken.

32. Deductions From Indications of the Board. Where separate control boards are in use for the several subdivisions (of the purchasing department) the work of each assistant will speak for itself. Of course the information thus afforded needs to be read with discrimination. Some classes of articles require more time to get to the order stage than others. It might be well in some cases, where the need is felt for such a step, to divide the requisition period into two parts, say one color representing the requisitions unacted on, and the other representing the period between the invitation to bid and the order issue. The delay in the second part may be due to different reasons from that in the first part of the requisition period. The board will also give valuable information regarding the manner in which orders are being filled, promptly or otherwise, by the firms selected for business. The presence of many reminder pins on the board would show a general slackness in this respect. The executive might in such case well inquire whether preference is being given to the best source of supply; that is to say, whether time is being unduly sacrificed to price. Too large a proportion of the wavy line, or of the color selected to correspond to this, might indicate that the traffic department was not in as close a touch with the railroad authorities as desirable, or

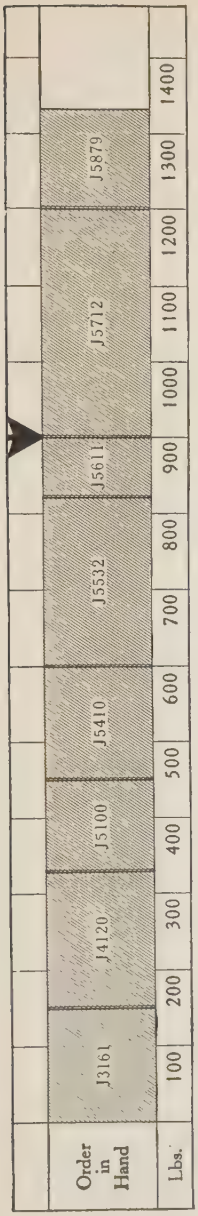

FIG. 5

even in some cases that the question of transportation by truck might advantageously be considered by the firm. Other deductions will suggest themselves, but it must be remembered that these suggestions are very general and only open up questions for further inquiry.

33. Loading Chart.—Another form of control is that shown in Fig. 5. This is of limited application, but is introduced to show the resources of control methods. If there is a contract with, say, a foundry, for a definite output per week, say 900 pounds of a special grade casting, then it is a matter of importance to know how far the contract is being overloaded so as to cause delay in furnishing goods. A grooved holder is graduated on the edge so as to indicate the number of pounds on order. When an order is given out, a card is cut to a length that represents its weight on the same scale. Thus *J3161* is shown as an order for 150 pounds, *J5712* as an order for 300 pounds, etc. As shown, the orders in hand represent an overload of 50 per cent. The principal value of the device is that the cards can be shifted about and placed in any order. The total length will not be affected, but the *sequence of orders* will be. Now, if every week this chart is gone over and the orders rearranged according to the known urgency of each, and this new sequence is tabulated, a copy of the sequence can be sent to the foundry, with instructions to follow it in making deliveries. By this means a fairly close control can be

obtained, in a simple manner, over a situation that would otherwise give occasion for some confusion, telephoning, and recrimination. Other uses, within the plant itself, will suggest themselves after a little consideration.

PRINCIPLES CONTROLLING STOREKEEPING

34. Physical Questions Involved.—The preceding articles have dealt with material only indirectly, in such matters as requisitions, bids, orders, control boards, and tracers. From this point on it will be necessary to consider the actual physical material, which requires not only office work, but actual handling, and demands not only attention, but occupies space. Here arises, for example, the problem of classification of material, not in the convenient form of records, over which there is ready control, but as applied to pieces of material of all sizes, shapes, and weights, some perishable, some imperishable, some of them perhaps dangerous and difficult to handle, and all of them requiring close care to prevent their getting into the wrong hands. Stores imply a storeroom, and this in turn implies careful physical arrangement, so that the articles shall be found, when needed, without delay in searching for them. Although these conditions may sound very simple and obvious, there are comparatively few plants where they are properly satisfied. Storage of raw and part-finished material is too often the weakest point in what may be otherwise a fairly well-organized plant.

35. Essentials of Good Storekeeping.—The ancient maxim, *a place for everything and everything in its place,* might well be posted up in every storeroom. It is the fundamental principle of storekeeping. What is more, the *place* must be easy to locate. This implies first, a logical grouping of like articles, so that, for example, pipe fittings shall be found in one region, electrical fittings in another, belting in a third, nuts and bolts in a fourth, and so on; secondly, a system of indexing every item, down to the individual sizes of such articles as wood and metal screws, so that not only shall there

be no doubt as to whether any given item is actually kept in stores, but so that the issue men may, without any loss of time whatever, go straight to the box, rack, or bin in which the size asked for is kept and produce the article wanted. These two essentials, suitable place and accurate index, form the very foundation of any system of storekeeping worth its salt. If there is anything more reprehensible in the stores than the lack of material that should be there, it is to have the goods on hand and not to be able to find them.

36. Exactness and Foresight Necessary.—Storekeeping is, or should be, an exact business. It is very much like keeping a cash box, with the difference that stores will stray away under conditions in which an open cash box would be perfectly safe. It also demands foresight, inasmuch as measures must be taken in time to replenish stocks that are falling low. Method must be relied on; mere unsystematic personal effort, applied to perhaps fifty thousand different articles, could not fail to result in confusion. As regards exactness, there are two main principles to observe: First, the storekeeper must be the actual recipient of all articles included in his care, immediately they are brought to the plant; second, no one must be able to get anything out of stores without his knowledge and a written memorandum of the transaction. These conditions, though so elementary, are in practice sometimes very difficult indeed to enforce. As regards foresight, a system of recording all receipts and issues of stores, coupled with a fixed limit, below which stocks must not be allowed to fall, for each class of article, makes the matter of foresight a purely mechanical one.

37. Influence of the Executive's Attitude.—In practice, the most carefully laid plans will not suffice to secure exactness in storekeeping, unless the situation is supported in the proper manner by the executive. There is nearly always more or less friction between the people who want the material and the people who keep it. The former have in general a more or less pronounced resentment against a system which prevents them from helping themselves, particularly in the case

of men working on repairs and similar work outside the regular line of processes. This often extends not only to the men themselves, but is shared by the foremen. The excuse of urgency is put forward as a reason why access to the storeroom should be allowed, under certain circumstances, on the part of persons who have no interest in storekeeping methods. Once permitted, such a practice will soon make accurate storekeeping impossible. Records will be found unreliable, articles supposed to be in stores will be found absent, material will be mixed up, things will be put back, if put back at all, in the wrong places. If it is felt that the executive will look indulgently on the excuse of urgency for practices of this kind, storekeeping as an exact business is at an end. In such cases the general efficiency of the whole plant is bound to suffer greatly, even though not visibly on the surface. The executive's opportunity in the matter is therefore an important one.

38. Centralized Storekeeping.—In a former article some of the reasons for centralizing purchasing in one office were considered. It is equally desirable to place the control of all stores under one head, with certain well-defined exceptions. If stores of similar character are not centralized under one control and recorded in the same set of records, it will not infrequently happen that a deficiency in one place is accompanied by a surplus in another. This will give rise, necessarily, to a condition of running to and fro, telephoning, questioning, and confusion, because wanted articles will have to be sought in more places than one. With proper records, on the other hand, the exact quantity on hand can be ascertained at once, so that every one has confidence in the figures. There are, however, some exceptions to this rule. Where stores are of a special character, they may be in separate charge. Stationery is an example of this class of special stores. Fuel is another. Some special raw material, say leather, may be placed in charge of a special leather storekeeper. In all such cases the principle is the same. If the special stores are homogeneous in character, and if each kind

of material is all kept in one place, there is no inefficiency in placing them where they will be most convenient, under a control independent of that of the main storekeeper. No confusion can arise, because the stationery stores will carry all stationery; the leather stores, all leather; the coal stores, all coal, etc.

39. Part-Finished Product.—In some manufacturing businesses an important role is played by what is commonly termed part-finished product. In making machines in large quantities, such as typewriters, sewing machines, electrical apparatus, and so forth, it frequently happens that, for economical manufacture, many of the parts must be put through in large batches. It may also happen that certain subsidiary mechanisms may be built up from these parts in considerable numbers, long before they are required for actual orders. The procedure in both cases is the same. The parts are delivered to the storekeeper, and treated by him just as if they had been purchased from outside. When it is desired to make up a batch of the small assembled mechanisms just spoken of, the parts are drawn out of stores, along with other regular stores, such as nuts, bolts, screws, and when assembled, the completed mechanisms are turned back into stores and treated, again, as if they were materials purchased from outside. The connecting theory in these cases is that such parts and mechanisms have in effect been made by the firm for itself. Instead of being purchased they have been made. There is no other distinguishing feature about them. It may even happen that certain articles may be made in the plant at one time and purchased from outside at another. The advisability of treating all such things on the same footing as purchased stores will therefore be clear.

40. Limits for Stores.—It has already been mentioned that the foresight necessary to prevent unexpected shortage of items is secured by method, and that this method is based on a system of fixed limits for the quantities of each item*

*A stores "item" is one size of one kind of article. It does not refer to individual pieces. Thus "½"×4" wood screws, brass, flat head" is one item, whether a single packet or 100 gross are carried in stock.

that should be held in stores. The fixing of such limits, where the practice is to be introduced for the first time, is not an easy matter. There are two opposing factors to be considered. The desirability of having a sufficient margin or surplus, is balanced by the desirability of keeping down the investment so locked up. In the case of the more costly materials, such as brass, copper, etc., this is an important consideration. But even the cheapest materials mount up in value rapidly when the individual classes run into many thousands. Certain controlling principles can, however, be applied. Slow-moving items, i. e., those that are not often asked for, should be kept low. Standard commercial articles that can be quickly obtained in the market may also be kept low in quantity. On the other hand, rapidly moving articles, items that are specially made for the firm, imported articles, and all items for which a quick market supply may not be depended upon should be kept in larger quantities.

41. Reviewing the Materials Situation.—All items, class by class, should be passed in review and a tentative limit fixed below which the store is not allowed to fall. In each class, sizes and varieties will also have to be considered. Limits should be fixed not only for the minimum of stocks to be held, but also for the maximum. By doing this, the quantity to be ordered on each occasion is automatically indicated. Once these two limits are fixed, the whole routine becomes mechanical, depending on simple bookkeeping to reveal the necessity for fresh ordering, and upon prompt observation and report of such necessity when making entries in the records. Periodical review of the materials situation is also advisable. Conditions of business vary, lines of product alter, new articles come in and supersede the older ones. Consequently limits fixed today may not apply a year hence. Items that have not moved for a prolonged period should be noted, and inquiry made whether it is not possible to reduce the limit on such.

42. Obsolete Stores.—It may sometimes happen that inquiry will lead to the discovery an item is no longer wanted,

owing to changes in pattern or other sufficient cause. In such cases steps should be taken to sell out the remaining stock, remove the name from the records, and employ the space hitherto allotted to the item in a more useful way. Where a review of this kind is held for the first time, an extraordinary quantity of obsolete material is not infrequently revealed, and its removal is attended with considerable benefit from every point of view.

THE LAYOUT AND ARRANGEMENT OF STORES

43. Enclosure of Storage Space.—A storeroom is like a bank. It is a place of deposit for valuable articles entrusted to its protection. There are three good reasons why storerooms should be enclosed spaces under lock and key: First, for safety against theft, a danger which is in proportion to the intrinsic value of the articles and their portability; second, for safety against unauthorized withdrawals, whether for legitimate purposes or to cover spoilage of good material which it is desired to cover up; third, to avoid errors in inventory, with regard to the amount of each item actually in hand. It does not follow that a storeroom is actually a covered and walled space. It may include a shed-area, or even open ground, fenced in. Many articles require no more than a roof over them, at most, and many others may be stored in the open air without detriment. In such cases the use of an expensive building would be inadvisable. It will suffice if the area devoted to storekeeping is adequately fenced so that access to it is impossible without knowledge of the stores officials.

44. Physical Arrangement of Stores.—Stores are very diverse, both in size and substance. Without going into the question of particular industries and their needs in this respect, it may be stated that even ordinary mechanical stores vary in size from tiny screws or rivets up to ponderous castings. Containers of every kind have to be considered. Material will be handled in boxes, sacks, bales, kegs, drums, rolls, coils, and rod form. Some things will customarily be removed from the containers as received, and placed in permanent

receptacles, others will be ladled out of kegs or barrels as required, still others will be issued from stores to the productive departments in the original unbroken packages. It will be evident from these considerations that the problem of a layout at once convenient and economical of space is no simple one. What is satisfactory for one plant may not suit even a similar plant. What is efficient today may grow unsuitable in a year or two. Under such conditions, precise rules cannot be laid down. The best we can do is to try to find some general principles on the subject of layout that each executive can apply to his own particular case.

45. Some Principles With Regard to Layout.—The principle of grouping together like kinds of stores has already been mentioned. In each class it is likely that there may be

FIG. 6

numerous items of quite small dimensions, capable of being kept in bins, racks, or drawers, while others will be either quite bulky or else kept in the original containers, such as

barrels or kegs. This suggests a second principle, namely, that of having one side of the storeroom devoted to compact storage of small articles in built-up fittings, and the other side left as open floor, or with rough portable racks where necessary, to take bulky stuff and materials kept in barrels, etc. Fig. 6 shows, diagrammatically, this arrangement. The horizontal rows, *A, B,* etc., represent space allotted to different classes of goods, say, electrical in *A,* pipes and pipe fittings in *B,* nuts, bolts, rivets, and screws of all kinds in *C,* and so forth. On the right half the shaded squares represent open areas with portable racks when required to hold long, heavy, or bulky material and that kept in containers. Wide alleyways are kept round this portion of the stores. The left-hand portion shows stacks of bins, and drawers, containing the smaller articles. The alleyways here need not be so wide. In this arrangement the two conditions, the keeping of similar articles together, and the segregation of small articles with small, and large articles with large, are reconciled. The reason for the difference in size of alleyway will be seen later.

46. Principles Regarding Fittings and Equipment.—One cardinal principle with regard to storeroom fittings may be given concisely: the nearer such equipment is to the idea of the expanding (sectional) bookcase so largely advertised, the better. It must be remembered that in the arrangement of stores nothing is final. There is no *best* arrangement that can be regarded as permanent. The reasons for this have already been given. Consequently, the more facilities we have for rearrangement—which means, in practice, for moving things around—the more likely is it that rearrangements will be made when they become desirable. Whether fittings, that is, shelves, bins, nests of drawers, racks, etc., are made of wood, or, as is now becoming the practice, of metal, the adoption of built-up sections should be insisted on by the executive. There will be, of necessity, several sizes of drawers, but all those of the same size should be interchangeable. Drawers, shelving, and bins should be in multiple or submultiple of any other size. This principle is followed, for

example, in the catalog of unit office furniture; drawers and receptacles of all shapes and sizes are furnished, but they all fit the same main framework. This is the ideal system for storekeeping, as far as it can be applied.

47. Locating, Indexing, and Finding Stores.—In a large plant the number of separate items kept in stores may run into scores of thousands. Even in a small one they may run into many thousand. Yet with adequate and even comparatively simple arrangements, the finding and control of each of these items presents no great difficulty. In the absence of such arrangements the whole stores question remains in a fog of confusion. It is easy to understand that every separate article should be known by a number, but the method by which this number may serve as a complete key to location, and also to control, needs to be explained in some detail.

48. Stores Reference Numbers.—Every item should be allotted a number. Upon the way in which these numbers are allotted a good deal of the success of the indexing and finding system will depend. Each number must suggest, in the first place, locality, and next, the individual article. It may go further than this, by suggesting not only the general region in which to look, but also indicating with considerable precision the particular part of such region. In adopting a system of numbering, complex groups of numbers and letters should be avoided. The simplicity of a telephone numbering system, in which hundreds of thousands of subscribers are instantly identified by three elements, the city, the exchange, and the individual number, should be kept in mind. The numbering of automobiles is equally simple. Thus *N. Y. 756-987* is a simple grouping that will identify the owner of a particular machine out of millions of such owners. Just as the *N. Y.* on the machine indicates locality, so, in stores reference numbers, it is well to lay out the area of the storage space into sections or regions, exactly as the United States is divided into states, and to affix a letter or letters to each of these regions, just as N. Y., Md., Ky., etc., indicate particular regions of the United States.

49. Division of Storage Space Into Regions.—Now if the method of designation of regions and their subdivisions by letters and numbers is combined with the physical arrangement of stores previously described, it is evident that a code can be worked out in which the letters indicate not only classes of goods, such as pipe fittings, etc., but at the same time the region in which they may be found. Fig. 7 shows the general idea of the allotment of regions. The storage-space plan is first divided into convenient horizontal divisions, and each

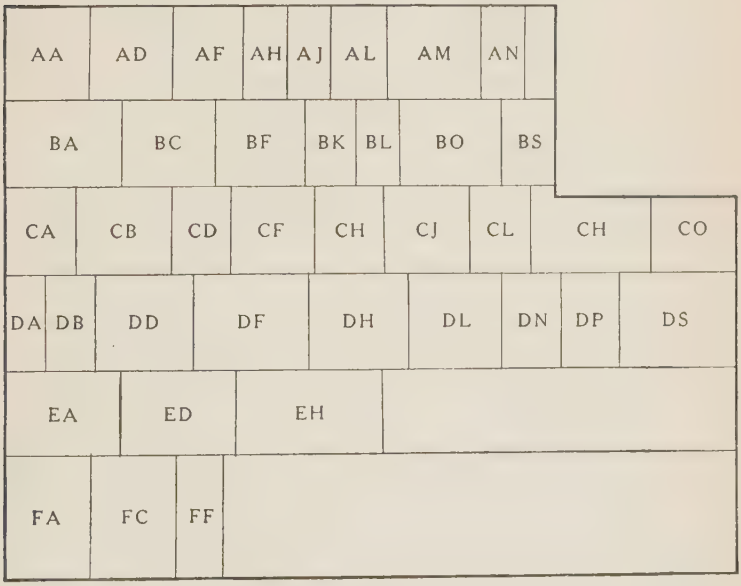

FIG. 7

of these divisions is earmarked for a different class of stores. Each horizontal division is then marked off in lengths, the divisions corresponding to the sizes of racks, cases of drawers, and open spaces as arranged therein. To each such length a different combination of letters is assigned (*AA*, *AB*, *AZ*). When this is done we have a plan for general classification. All the *A* row, for example, may be allotted to electrical goods. All the *B* row may be pipes and pipe fittings, and so forth. Then as to the cross divisions, *AA* may be switches,

AF cut-outs, *AM* motors, etc. Now, if each article bears a serial number, *a two-wire, type 4 cartridge fuse, 250-volt, 200-ampere 1¼-inch cut-out* will, for example, be designated as *AF3231.* When asked for this number, the issue man will know at once that electrical goods, sub-class cut-outs, are in question, and further, he will know exactly where to walk to in order to lay his hand on the item wanted. But the number may give him more precise information even than this.

50. Numbering of Tiers.—Every vertical layer or tier of receptacles may very easily have its own series of numbers allotted to it. Fig. 8 shows how this may be done. This

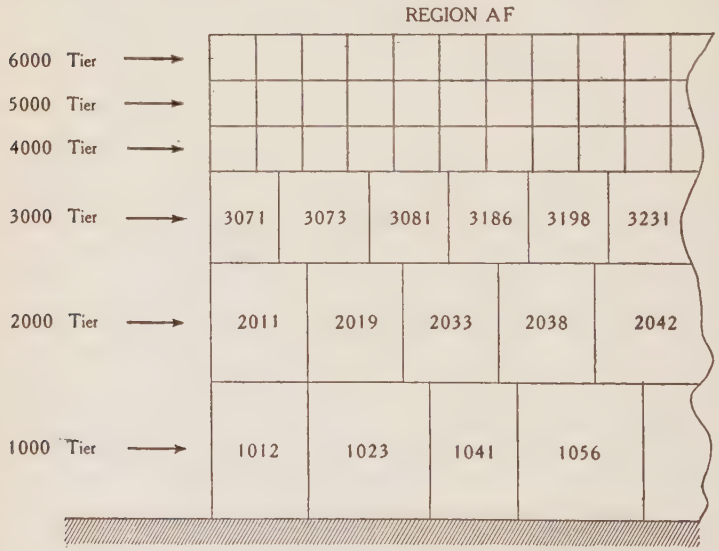

FIG. 8

represents, say, region *AF,* consisting of open bins in the lower portion and nests of drawers in the upper. Each layer or tier begins with a new thousand, *1000* for the lowest tier and *6000* for the highest. Now the cut-out mentioned in the last article, being numbered *AF3231,* will obviously be found on the third tier. Thus the very simple code described indicates, first, the class of material; second, the general region

in the stores; third, the kind of article; fourth, the actual region; fifth, the individual article; and sixth, the tier in which it will be found. In a later article will be described how the store reference number is used in a *finding index,* not only for the use of the issue men, but also for the use of those persons in the plant and planning departments who have occasion to requisition for stores for issue to the productive departments, and how that number is employed for indexing the ledger cards which control the quantity of material of each kind held, in accordance with limits.

51. Construction of Stores Codes.—In making up codes the letters *I* and *U* are omitted, as liable to be confused with other letters. This leaves twenty-four letters. If to the alphabet so pruned we attach four figures, viz., those between *1000* and *9999,* so that the combination reads, for example, *K8769,* we have close on two hundred and twenty thousand combinations at our disposal. Since plenty of vacant numbers and letters should be left when making up a code, to allow for the intercalation of new sizes and kinds of material, this would only serve a comparatively small stores organization. With two letters, however, such as *AK5487,* the number of combinations between *AA1000* and *ZZ9999* is over five million, a series large enough to cover the requirements of all but the most extensive concerns. Where it is thought necessary to do so, a three-letter combination may be employed. This will run from *AAA1000* to *ZZZ9999,* and contains the enormous number of about one hundred and twenty-five million combinations, an inexhaustible quarry for all practical purposes. For general purposes the two-letter code, arranged by regions and tiers as indicated above, will be found the most convenient.

52. Accessibility of Stores.—In laying out storage space, due consideration should be given to the manner in which material is to be conveyed to and taken from store receptacles. This is a very big subject and can only be glanced at here. Much will, of course, depend on the physical characteristics of the material. The handling of small and

light articles is not much of a problem, but when heavy, bulky, and awkwardly-shaped material is in question, a good deal of thought may with advantage be given to this aspect of the matter. Where heavy castings and forgings are stored, some portion of the stores area should be served by an overhead traveling crane. Where smaller castings, too heavy to lift by hand, but not large enough to merit a regular traveling crane, are stored, an electrical tractor furnished with a crane tackle will be found useful. To employ such an appliance usefully, the width of alleyways and the reach of the crane arm should be duly considered. Long things, like tubing and rods, must be placed so that they can easily be drawn out of and placed in their racks without blocking alleys. The alleys alongside bins and drawers where small articles are stored may be reduced to a minimum, but should be wide enough to admit a wheeled truck or platform on which stores may be placed for distribution. All alleyways should be thoroughly lighted, particularly those where materials are kept in drawers. Most storerooms are very deficient in this respect, yet nothing is more conducive to error and loss of time than imperfect lighting.

ROUTINE OF STOREKEEPING

53. Simple Nature of Storekeeping Routine.—The main operations in storekeeping are few in number and simple in character. Such difficulties as arise are caused, not by any complexity, but by the very large numbers involved. The work consists of innumerable transactions, many of them quite trifling, but in each such transaction there is ample opportunity for error. In proportion as the effort is made to make storekeeping exact, as it should be, difficulties show themselves. Nevertheless, exactness is largely a matter of habit and routine. The introduction of exact methods for the first time is commonly a discouraging affair, because innumerable examples of laxity are generally uncovered, and the reiterated assurance of every one that the proposed method is impractical may seem only too true. The executive who grasps the simple principles

involved will, however, be able to distinguish between real difficulties and those due to a too easy standard of efficiency on the part of the persons concerned. He will see that what is called for is merely a habit of thinking with reasonable accuracy, and acting in the same manner. By degrees, if pressure is kept up, men will begin to appreciate that a hundred articles means a hundred, and not ninety-five or a hundred and three. They will understand that it is mere laziness to put things down otherwise than in the appointed place; that they must return articles to their proper bin; that nothing must be given out under any circumstances without a written memorandum of issue; when these lessons have been learned, an approach to real storekeeping will be possible.

54. Three Main Divisions of Routine.—There are three principal divisions of storekeeping routine, each dealing with a different aspect of the work. First, everything that relates to the receipt of goods, up to and including their distribution to their allotted receptacles; second, everything that has to do with the issue of materials to the plant, from the presentation of a demand voucher to the handing over of the articles; third, everything that relates to the recording, at one point, of the quantities and values involved in the operations named; such recording includes making the necessary deduction to determine the quantity left on hand, always with a watchful eye on the prescribed limits. Requisitioning for a further supply of articles, and watching until they arrive, may be considered as part of this third division of the work, which thus includes everything relating to balances. Receipts, issues, and the maintenance of balances make up the principal responsibilities of the storekeeper, as regards routine operations.

55. Routine of Receipt and Acceptance of Goods. Incoming material is usually received by a receiving department, to which all goods, arriving by any route or means, are delivered. This department examines the package for physical condition, and signs the carrier's way-bill. The goods are then unpacked and the storekeeper is notified. If a specification and tests are involved the technical department makes

its examination and issues its certificate that its conditions have been complied with. The consignment is then taken into stores and an entry is made in a stores received book. If the goods are new to the stores, they must be given a location, and a stores reference number corresponding. A ledger card is made out for each item, the price is entered on the pricing index, and they are then put away in the location assigned. If the goods are merely a fresh supply of items previously carried in stores, they are put away as soon as they have been recorded on the stores received book. The consignment is, of course, checked as to number, weight, size, etc., to see that it corresponds in all respects with the order, and with the advice note or bill. The stores received book is a journal from which entries are posted to the debit or charge side of the ledger cards.

56. Routine of Stores Issues.—The routine operations in connection with the issue of stores to the productive departments are even simpler than those relating to their receipt. The storekeeper, or his issue man, has merely to honor drafts presented by the persons wishing to get material, when signed by a recognized authority. These drafts are termed material vouchers or stores issue notes. They specify, (*a*) the item required, with its identification by the stores refernce number, and (*b*) the quantity, weight, or number required. Other information as to the destination of the material, after it is withdrawn from stores, is also given, but has nothing to do with storekeeping as such, any more than a banker has any interest in the question of how the money drawn out on a check is spent. On presentation of the voucher, the issue man gets the material and hands it to the person presenting the voucher. The voucher is then handed to the storekeeper's office for record on the stores issues book. This book is a journal from which entries are posted to the credit side of the stores ledger cards.

57. Balances.—The routine of receipt, terminating in an entry in the stores received book, and that of issue, ending in the acquisition of a discharged material voucher, and entry on

the stores issue book, have now been described. It remains to show how these records are applied to control balances, so that the quantity of any item shall not fall below the fixed minimum.

58. Stores Item Ledger Cards.—Each item is given a separate card. These cards are known by, and bear, the stores reference numbers as well as a description of the item. They are filed in the order of those numbers and letters. In the simplest case, all that is necessary is to enter, on the left or debit side of the card, an account of the quantities of the item as received, and on the right or credit side entries are made from the stores issue book, giving the amount of material issued. After each fresh transaction, a balance is struck, which balance will of course give the quantity of the item remaining in stores. The maximum and minimum limit for the item is prominently displayed on the card. Each time a balance is struck, it is compared with the limit. If this balance is close to the limit, the storekeeper is advised, by an entry on a stores wanted book. He then proceeds to requisition for a further supply. It will be seen that the routine is quite automatic, but implies vigilance on the part of the clerk, when striking balances, to note and report when an item is close to the inferior or danger limit.

59. Further Control by Stores Ledger Cards.—The development of automatic foresight is sometimes carried a stage further. Fig. 9 represents a ledger card (in diagrammatic form only) that illustrates this application. As hitherto described, the ledger card only shows one thing, namely, what is the actual balance of each item on hand. In highly organized plants, more than this is required. The fact so ascertained requires extension in both directions, namely, as to what may be on the way, and as to expected or ascertained future uses. In addition to the *received, issued,* and *balance* columns of the ordinary ledger card, two new ones are provided. On the left will be seen one headed *On Order.* Near the right will be seen one headed *Allotted.* The actual difference between the *received* and *issued* columns is 2,000, but a reading of the

card will disclose these facts: (*a*) 1,000 articles have yet to be received out of 5,000 ordered; (*b*) 1,000 have been earmarked or allotted to production orders now in sight; (*c*) a free or unreserved balance of 1,000 is in hand. The earmarking or reserving of items in this way is very much like the certification of a check. A material voucher is presented, but instead of being honored at sight by the issue of material, it is simply indorsed as being reserved, and the material is then held, safely, until it is wanted. When the material is

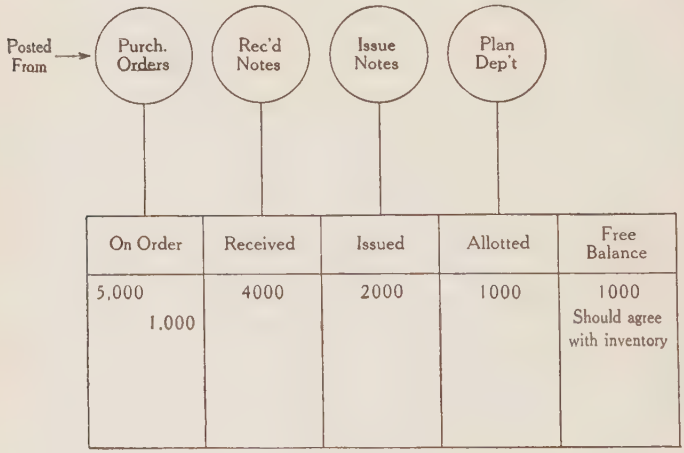

FIG. 9

actually issued, the entry is canceled in the allotted column and entered in the issued column as usual. It will be seen that a wider grasp of the movements of material is obtained in this way.

60. Adjustment of Price Differences.—In the case of a new supply of an item that is already carried in stores, it will often happen that the new lot has been purchased at a different price from previous lots. It will also happen that the old supply is not entirely exhausted when the new one comes. There are, then, in the one receptacle, two lots of the same material—one lot at the old price and one lot at the new. At what price is the combined lot to be issued? There

are two methods of procedure and each has its advocates. One way is to average the cost of the combined lot and to make a new (average) price. The other is to take precautions to issue the old at the old price till it is exhausted, and then use the new price. Each of these plans has its earnest advocates, but as a matter of fact there is very little to choose between them. Perhaps the safest way is to average the price as soon as the new entry is made in the ledger, and to enter a new figure on the pricing list. The executive should select one method or the other, but only *one* such method should be allowed. The accounting must not be done in one way at one time and in a different way at another time. A uniform method is essential if serious error is to be avoided, and in most cases the averaging method is the safer.

61. Finding Index.—The way in which stores reference numbers are originated has already been explained. Fig. 10 shows how they are used. This illustration represents one card of a finding index or, as it may be termed, classified directory of material. The card lists all those varieties of *type 4 cut-outs, 250-volt, cartridge fuse,* that are kept in stores. Similar cards are devoted to other articles, or to definite groups of any kind, as, for example, the different diameters of 3″ bolts, of 2″ wood screws, of the various grades of glass, paper, and so on. The classification of stores is a much neglected subject, so that every storekeeper will have to make his own. When the task is accomplished, he will have, perhaps, twenty thousand different items, grouped in natural and convenient groups, each group on a card. There may be, for instance, 3,000 groups, averaging about seven items

TYPE FF
(Cartridge Fuse)
250 v. Cut-Out

2 Wire	1¼″	200A	AF3231
	1½″		3232
	2½″		3236
4 Wire	1¼″		3300
	1½″		3301
	2″		3303
	2½″		3305
2 Wire	2″	400A	3400
	3″		3405
	3½″		3407
3 Wire	2″		3469
	2½″		3421
	3½″		3425
	4″		3428

FIG. 10

per card or group. The cards will, of course, be arranged in broad classifications corresponding to the regions, *electrical fittings* together, *pipe and pipe fittings* together, and so on. To find an item, refer first to the division, *electrical;* then to the subdivision, *cut-outs;* then to the group, *type 4,* and so to the actual item sought, namely *2 wire 1¼-inch,* the stores number of which is found to be *AF3231.*

62. Price Indexing.—At some point in the record of production, the material used, as recorded on material vouchers, will have to be priced out. Most conveniently this will be done in the storekeeper's office, each such voucher being priced and extended as it comes in. In any case a price index will be needed to indicate the current official price of each item. The price index is nothing but a copy of the finding index described in the last article, provided with space at the right-hand side for prices. These prices will be the purchase price, plus freight, customs duty, or other additional charges. It will be understood that they are subject to change whenever a new lot of goods has been purchased at a new price. The new price to be entered on the card will usually be, not the new purchase price, but the new averaged price as explained before. The change of prices should be made on the index without loss of time, so that all material given out after receipt of a new lot shall be correctly priced at the new average.

63. Uses of the Stores Reference Index.—The index to stores reference numbers has many uses. As it forms a directory of the material that is kept in stores, it will be consulted by every one who has to do with using material in the plant. The planning department will refer to it to indicate material wanted for production orders; repair and maintenance foremen will make out their material vouchers by its aid; the stores-ledger clerk uses it as his guide for classification of cards; the stores-issue man uses it as a location finder in putting away fresh supplies of material; the pricing clerk will use it (with the addition of prices) as his guide for locating prices. Its value to the purchasing department is also obvious. If carefully compiled, and rigorously kept up to date, the index

forms a valuable regulator of routine. Its precise form is a matter of individual preference, but the general idea as described in foregoing articles is an essential feature of a well-managed storeroom.

64. Continuous Inventory.—It has now been shown how the storekeeper receives goods, how they are made the subject of a ledger entry, after having been allotted a stores reference number and a location. The issue of stores, with pricing of vouchers, and ledger entry, has also been described. Further, it has been indicated how ledger balances are made up at the close of each transaction. Next must be considered how these balances are checked, so that confidence may be felt as to their trustworthiness. In former days, and even now in old-fashioned plants, balancing and checking up with actual stores-in-hand were put off until special periods of the year, yearly or half-yearly stock taking. This usually involved the closing down of the productive departments for several days or a week or more. Today, this is considered bad practice. As ledger balances of all items are always available for comparison with actual holdings, it is usual to make every day a stock taking day. Every day a certain number of items are weighed or counted and the actual stock compared with that shown by the ledgers. Discrepancies in value are balanced one against another, and the total deficit charged against profit and loss at the end of a month. The number and amount of these discrepancies form a gauge of the efficiency of the routine storekeeping operations.

65. Requisitioning Fresh Supplies.—When the balance on hand of any item is reported at the danger limit, the storekeeper proceeds to make out a requisition on the purchasing agent for a fresh supply. The amount to be ordered is determined normally by the maximum limit set for that item. Thus, *cut-out AF3231* may have a minimum limit of 12 and a maximum limit of 50. This implies that as soon as the stock on hand falls to 12, it is reported on the stores wanted blank, and the storekeeper thereupon requisitions for 50.

66. Watching Progress of Requisitions.—The storekeeper must not only requisition for the goods, but must also keep in touch with the situation until he actually gets them. Every requisition should bear a due date, i. e., the date at which the goods are expected. Ordinarily he need not trouble further until such due date arrives, but in the case of important items which he has reason to know will actually be wanted at or near such date, it will be his duty to follow up on the control board the progress of the transaction, and if delay is observed at any stage, to make the necessary representations to the purchasing agent.

SOME SPECIAL VARIETIES OF STOREKEEPING

67. Patterns.—It is by no means an unknown case for wood patterns to be stored so unsystematically that a search lasting for hours, among pieces of wood of all sizes and shapes, is necessary before the pattern sought is discovered. A pattern is often a singularly hopeless thing to identify from its appearance. It often happens that a pattern storekeeper who has grown up with his stock relies on his memory. He identifies his items as a shepherd is said to do with his sheep—by their faces. When such a man leaves, confusion reigns as a matter of course. This is no fancy picture. A record of patterns should therefore be kept, either arranged by simple serial number or else classified on the stores reference number plan. In either case there is required, (*a*) a written record minutely describing what the pattern is for, (*b*) a number painted or stamped on the pattern itself, (*c*) a system of location of the patterns in a pattern store according to their number. Where possible, the number of a pattern should be affixed in raised figures, so that it will appear on the casting. This serves to identify the castings also beyond all question. A file of blueprints referring to the castings, and bearing the same series of numbers as the patterns, is useful in many cases.

68. Castings and Forgings.—The preceding article may be considered to apply to castings and forgings also. Great care is necessary to identify such articles if they are not

adequately indexed and kept in numbered location. While patterns are usually kept in a pattern store under care of a pattern storekeeper, castings and forgings are kept in the regular stores under the charge of the general storekeeper.

69. Lumber and Wood Material.—Where lumber is used in any quantity, it should be placed in charge of a man having experience of such material. This is necessary not only for its physical welfare, but also that the issue of material on vouchers shall be accurately made. Wood measurement is a somewhat intricate business, quite different from simple weighing and counting which control ordinary stores Errors are easily made by one unfamiliar with the work.

70. Tools, Gauges, Etc.—Small tools and precision tools are subject to purchase and stores routine like any other article, but in machine shops a further stage of routine is commonly involved. Such articles are kept, not in stores, but in a tool room, where they are issued to and taken back from the workers as the work requires. This has nothing to do with storekeeping. As soon as such tools are received, inspected, and entered on the stores books, they are usually issued to the tool department and charged out to it. The storekeeper has no further responsibility for them.

71. Non-Engineering Plants.—Nearly all plants have some sort of engineering or repair department, and in engineering industries one stores takes care of all material. But in textile, leather, and other similar trades, the material used in production is not of a mechanical character. In such cases it is usually put in separate charge, and the books and records are kept entirely distinct from those of the mechanical or general stores.

72. Fuel.—Fuel, whether coal or oil, is so separate and distinct an interest that responsibility for it is placed on the power department rather than on the storekeeper. In small plants this may not be the case as regards bookkeeping, but the responsibility for its care can hardly be placed on the storekeeper.

LABOR SAVING IN HANDLING MATERIAL

73. The Executive's Opportunity to Economize. It is only very recently that much attention has been given to the problem of minimizing the handling of materials by sheer muscular power. Nearly everywhere there is far too much pushing, pulling, and pawing-over of materials by hand. This is not only, at present wage rates, a very expensive matter, but involves much unnnecessary damage to containers and their contents. In most plants the executive will find this a profitable field for study. The subject is a large one, and in these pages it will be possible to indicate only a few of the modern appliances that are being introduced. Both the possibilities and the method of application will vary from plant to plant.

74. Advantages From Labor Standpoint.—The advantages of mechanical handling are not confined to saving of time and money. One important consideration is that where tractors and mechanical appliances are employed, the labor concerned is of a higher grade and much more inclined to keep on the job. Cases are plentiful where great trouble has been found in keeping handling crews up to strength, on account of the heavy turnover of labor, while the adoption of mechanical appliances has not only greatly reduced the number required, but has also very largely eliminated turnover.

75. The Use of Skids and Transveyors.—One of the simplest devices for saving unnecessary handling is the *skid,* sometimes called platform, used in connection with either hand-lifting trucks or *transveyors* or with electric tractors that not only lift the load, but transport it. As will be seen from Fig. 11, the skid is merely a board or platform furnished with two runners. The dimensions shown in the figure apply to large skids used in connection with tractors, although a skid of the size shown can readily be hauled short distances by special types of hand machines. A smaller type can be moved by hand machines but not by tractors. Each type has its special applications.

76. Electric Elevating Tractors.—The illustration in Fig. 12 is a diagrammatic representation of an electric tractor capable of handling skids of the dimensions shown in Fig. **11.**

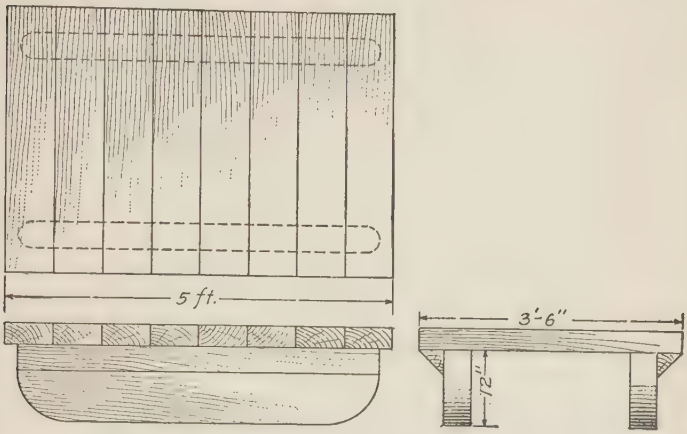

FIG. 11

In front of the tractor is a long, narrow tongue or platform supported on small wheels, and carrying a steel apron that can be made to rise or fall by electric power. In moving skids, the tractor is run up to the skid so that the apron slides *under* the

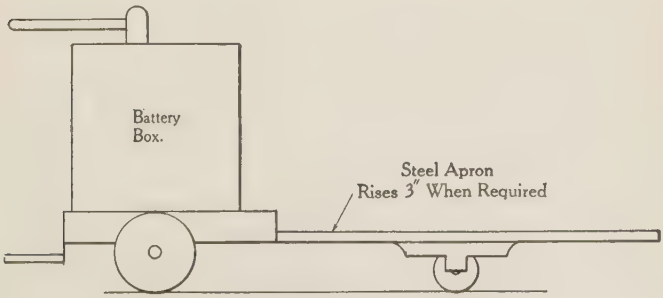

FIG. 12

body or platform of the skid. The gear is then set in motion, the apron rises and lifts the skid off the ground about three inches. The tractor is then free to run, under its own power,

wherever it is desired to deliver the goods. On arriving at the destination, the tractor stops, the gear is set in motion, the apron descends, the tractor backs out, and the skid is left behind on the floor.

77. New System of Handling Introduced by Skids.—The skid and tractor are not merely a method of transport. Their proper use involves a new system of handling materials. An actual example will perhaps demonstrate the principle most conveniently. In a certain stationery-making plant, it was usual to receive paper in reams, flat, from cars at the depot, and keep it in stores till wanted by the cutting machines. This involved the following handlings:

1. Unloading at railway car, stacking on road truck.
2. Unloading at receiving platform, delivering to stores on wheel truck.
3. Stacking in stores.
4. Taking down from stack and loading on wheel truck.
5. Delivering to cutting machine room.
6. Unloading from truck and stacking on floor.

When the skid system was introduced, the skids were taken in the road truck to the depot, and the following was the series of operations:

1. Unloading at car, stacking on skids.
2. Transporting skids from receiving platform to stores.
3. Transporting skids, as wanted, one by one, from stores to cutting machine room. Skid left on the floor.

In other words, all handling between the first unloading from the car and the final handling from the stack into the cutting machine was entirely eliminated. It will be observed that this was not a saving in transportation distance, since the goods followed the same path, but a very great saving in handling the goods over and over unnecessarily. Since every such handling of paper tends to damage some of the sheets, a still further saving was effected. Also, of course, the whole process occupied far less time. Unloading of the road truck was effected in a fifth of the time, while the wheel truck was not used at all.

78. Principles of the Skid System.—The general principle is to get the material on to skids at the unloading point, transfer it to stores on the skids, and if the nature of the goods and processes permits, keep the material on skids in stores and deliver it to the point of use without disturbing it. This cannot always be done. Smaller quantities than a whole skidful may have to be delivered. Even then it may pay to take the full skid to the point of use, remove the material wanted, and to return the skid to stores. Where space is precious, it is possible to put skids in tiers, by means of a special

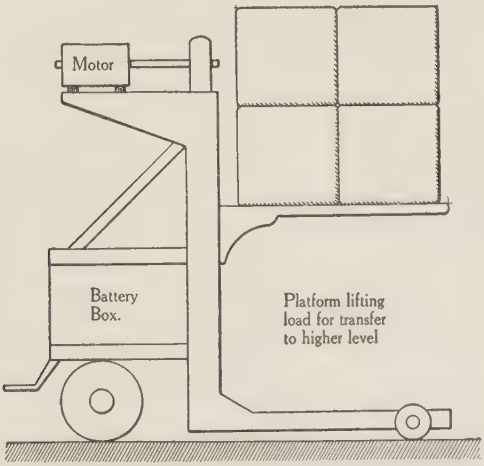

FIG. 13

electric tractor tiering machine, as shown diagrammatically in Fig. 13*. In this machine the movement of the apron, instead of being only a few inches, is about four feet; by the aid of special racks it is thus possible to place one skid above another. The skid principle is, however, best adapted to plants that have plenty of floor space available for storage purposes. New stores layouts can be specially designed to obtain the best advantages of the system, ramps, or inclined planes, being used between floors instead of elevators.

*This type of machine will also deliver to railroad box cars from the track level, thus obviating the expense of loading platforms

79. Method of Arranging Skids in Storage.—The illustration, Fig. 14, shows how skids should be *staggered,* or placed at angles, to permit of quick handling. The tractor has only to make a half turn to put away or withdraw a skid. In one plant where gray cotton bales are stored, several thousand bales, two or three to a skid (according to size) are stored on this plan, the storage space covering nearly two acres of basement. The bales are received through a chute from cars, weighed, placed on skids, put away, and when wanted are taken

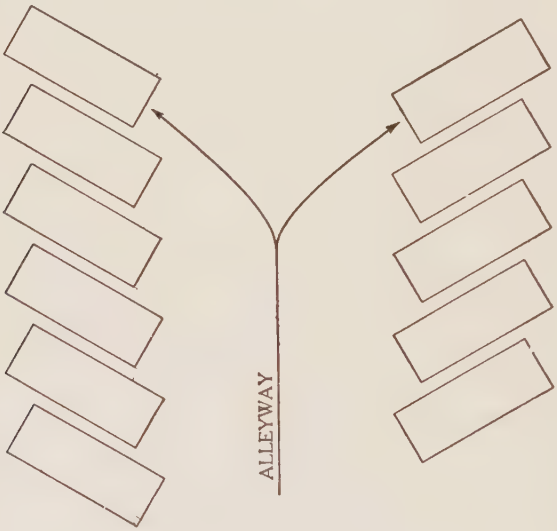

Fig. 14

out and run direct to the "gray room" where they are opened up for process work. The long strings of laborers, laboriously pushing baggage trucks with one bale on each, which were formerly a familiar sight in this plant, are no longer seen, and very much quicker and surer location of any particular bale when wanted is effected than formerly.

80. Hand Tiering Machines.—In addition to the electric tiering machines just described, hand tiering machines can be obtained which will operate in comparatively narrow alley-

ways. These are used for placing barrels and kegs in racks, stacking bales in piles (where it is not required to get at individual bales), stacking cases of goods, and in general elevating any object of moderate size up to twenty or more feet, so that it can be placed on a pile or stack. This type of machine is not, however, adapted for transporting goods. Its only function is to elevate, either by hand or by electric power.

81. Review of the Handling Situation.—The brief descriptions of modern methods just given will serve to show the executive a line of approach to the problem under consideration. Once the principle is grasped that the amount of actual *handling* (in the strict sense of the word) should be reduced to a minimum, the practical applications of this principle will readily be brought to mind by making a survey of each class of material in the stores, and asking the question: "are all these handlings really necessary?" The more bulky, awkward, and heavy the material, the greater is the advantage gained in reducing handling. Often also, by having goods packed by manufacturers in certain size cases, kegs, bags, etc., it can be arranged that the unit size thus set up will go through many stages without breaking bulk and consequently with a saving of expense for handling.

82. Counting Machines.—Another mechanical device of great value in the stores is a machine which weighs and counts. Where daily inventories are taken it is in fact essential. The principle of the machine can easily be explained. Each machine has two pans, in one of which is placed a stated number of the articles to be counted, say ten, while in the other larger pan, the bulk of articles to be counted are placed. The number is then read off on a beam. When giving out stores by count, such a machine saves much time and greatly promotes accuracy. To count out, say, 167 pieces, is laborious and slow work, and much liable to error. But with the counting scale it is as easy as counting out six or twelve pieces. In inventory taking, the importance of not having to depend on a perfunctory count is obvious, especially when the question of mental fatigue is considered. Inventory taking is monotonous

and uninteresting work at best, and any device that relieves the tedium will certainly promote both the speed and accuracy of the work.

EXECUTIVE CONTROL OF PURCHASING AND STOREKEEPING

83. Points for Particular Attention.—Although the executive does not under ordinary circumstances come directly into relation with questions of material, it is necessary for him to have a general grasp of the operations on material, in order that their efficiency may be maintained. The points on which his attention should be particularly directed may be divided into two groups: (*a*) finance and (*b*) routine.

84. Control of Investment.—In many cases there is a tendency toward accumulation of stores beyond current needs. Obsolete sizes and kinds are not eliminated as they should be. In badly organized concerns stores are lost sight of. Fresh supplies are ordered where a sufficient supply, temporarily mislaid or forgotten, is on hand. In a comparatively small plant in which old-fashioned methods had been in use for many years, a rigorous survey of the material situation disclosed fifteen thousand dollars worth of material, raw and partly manufactured, mostly brass and copper, that had been laid away in odd corners and forgotten. This tendency points to the necessity of a systematic watch on the part of the executive as to the value of the balance in hand.

85. Charting Value of Stores in Hand.—The illustration, Fig. 15, shows a chart arranged by weeks, on which the weekly balance of stores on hand is plotted. The curve for the previous year may usefully be plotted in colored ink, for comparison with current balances. In many businesses, where seasonal variations play little or no part, the curve of balances will be almost a straight line. In other cases the seasonal variation will yield well-marked peaks and depressions. A chart such as that illustrated enables the executive to see at a glance what is the general condition of stores. The

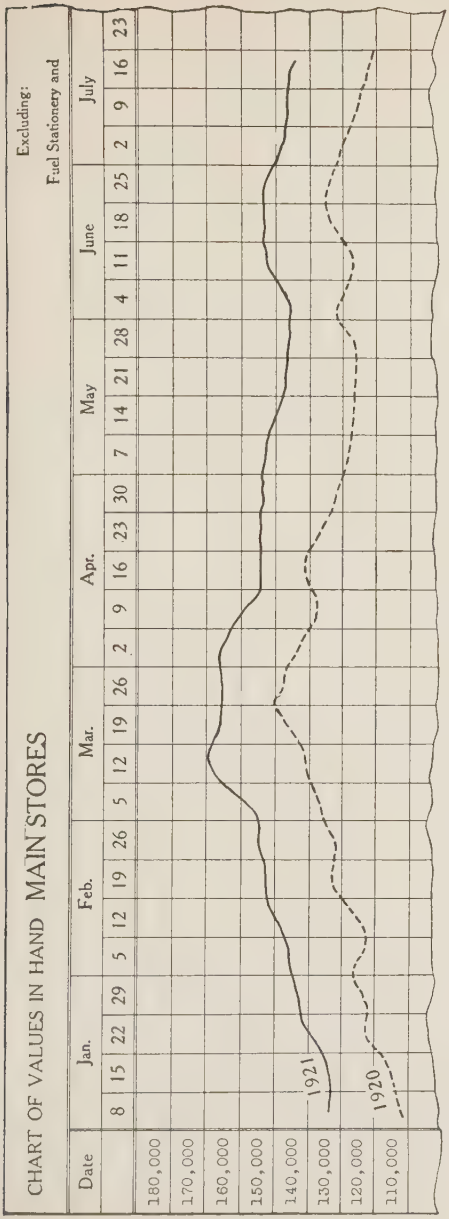

FIG. 15

readings do not convey any absolute meaning. That is to say, they must be read with judgment and a knowledge of what is going on in all directions through the plant. Thus, a sudden rise in the balance may be explained by the accumulation of special material for a large order. A continued rise or fall may be due to urging on or holding off buying on account of market conditions. The chart must be read intelligently to make use of its indications. Only after it has been compiled for a considerable period will it begin to be of service, but once in working order it provides the executive with a simple and useful control over the investment that is locked up in material of all kinds.

86. Charting the Liabilities of Purchasing Department. — A method of keeping

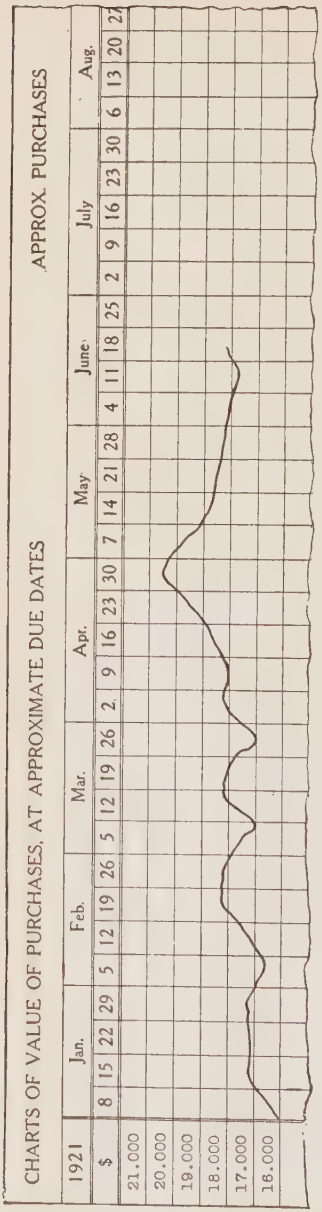

Fig. 16

track of liabilities incurred by the purchasing department is shown in Fig. 16. It is important for the executive to keep in touch with the approaching liabilities that have to be provided for, and by use of this chart a close control is obtained of such liabilities at the moment they are incurred. The orders given out each week by the purchasing agent are classified, first by due dates, and then as to each due date, by the terms of the order as to payment. Thus, in any given week, there may be $400 worth of orders given out, expected to be billed in 3 weeks, and paid for in 10 days thereafter. Another group, amounting to $3,800, may be billable in 5 weeks and on 30-day terms. An analytical column sheet kept in the purchasing agent's office will enable these items to be inserted in the column representing the week at which they will fall due for payment. They are then added to any amount already scheduled for payment in the same period. The total is entered on the chart. The curve should be kept in pencil, as it will require alteration when new amounts fall due on

particular dates ahead. By a survey of this curve the executive is enabled with a minimum effort to keep in touch with the incurred liabilities. A second curve may show payments made on purchasing account. This will be dealt with in another Section.

87. Watching the Cost of Operation.—It is sometimes desirable, where storekeeping operations are extensive, to chart the combined cost of purchasing and storekeeping, reduced to a basis of cost per $1,000 purchased. This is, in effect, a percentage basis. A chart thus prepared is shown in Fig. 17. It is of most value when the figures for previous

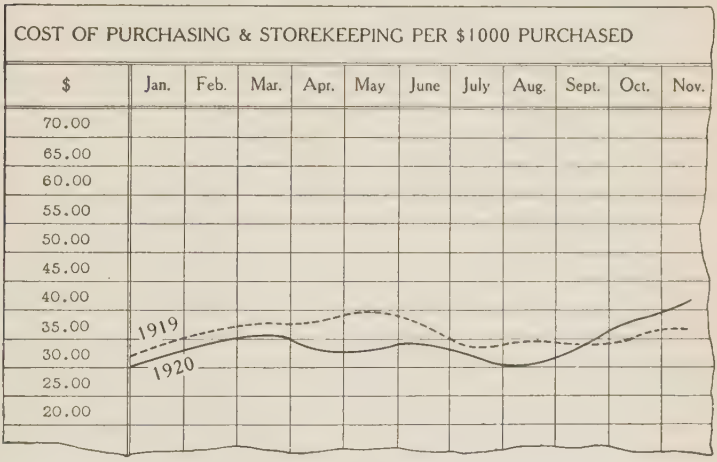

FIG. 17

years have been accumulated and are charted in separate curves for comparison. As with the other curves described, its readings must be made with judgment and knowledge of the circumstances likely to cause variations. Nevertheless, variations in cost will in all cases suggest inquiry, though no hasty assumption must be made that anything is wrong. A steady curve, on the other hand, may be equally suggestive of a cause for inquiry, if it is known to be coincident with a shrinkage of business. Experience in a particular plant is necessary to derive benefit from the curve, but as in the other cases, when

once established, the curve will be found a concise method of control.

88. Control of Efficiency in Routine.—There are two principal directions in which the executive may keep watch in order to control the efficiency of routine operations. One is with regard to delays and the other with regard to errors. It is very important that responsibility for delays shall be localized, and classified, so that blame shall fall on the right shoulders. The errors referred to are mainly those of incorrect storekeeping, leading to discrepancy in inventory.

89. Classifying Causes of Delays.—The control board holds a record of the time-history of each requisition, and consequently also of delays. The only other cause of delays will be the default of the planning department or the storekeeper in not getting out requisitions promptly. One method of control is to cause the productive department to report, as a matter of routine, all delays in obtaining material, and having each case investigated, by aid of the control board record, and the cause assigned. Results should be tabulated under the various heads, such as *delay in issuing order, delay in filling order, delay in transportation*, and so forth. By degrees a body of information will be acquired that will enable the executive to judge whether measures should be taken to expedite routine in any department. A more thorough method is to supplement the foregoing steps with an abstract taken weekly or monthly from the control board, showing the actual number of days taken by each stage of a requisition, and thus finding the average time taken in each stage.

90. Errors in Storekeeping.—Inventories will be taken every day, as described in a preceding article. In many cases discrepancies will be found between the tale of articles actually located by count or weighing and the figures shown by the stores ledger card for the item. The balance of such discrepancies, i. e., the net loss or gain, will have to be written off in the profit or loss account. To effect this, it is usual to rule the inventory sheets with cash columns, so that the amount

over or *under* of each item, may be extended in either the loss or gain column as the case may be. An abstract of this information should be prepared for the executive. Such an abstract should show: (*a*) The number of items found incorrect; (*c*) the number of articles and the value of the maximum gain and the maximum loss; (*c*) the net gain or loss. These weekly results should either be charted or tabulated in the executive's office so that a running comparison of the errors may be made. Any tendency to increase will thus be readily observed, or if the average is high and shows no signs of reduction, it will suggest that steps be taken to inquire as to the causes for this unsatisfactory state of affairs.

91. Conclusion.—It will be observed that the executive's control over material rests largely on the principle of exceptions. His attention is called to matters when they are ceasing to be normal. Rising investment, unusual liabilities being incurred for purchases, abnormal cost of operation, excessive delays, and too high an average of errors, are the things that will call for action. When everything is proceeding normally, a glance at the charts and reports will show that this is the case, and he can then turn to other work without the necessity of more detailed examination. But a thorough grasp of the general routine both of purchasing and stock keeping is necessary in order to apply the proper remedies for unfavorable conditions when they are found to exist.

THE MAKING OF AN EXECUTIVE

(PART 5)

Serial 1988E Edition 1

THE EXECUTIVE AND THE FACTORY

NATURE OF FACTORY OPERATIONS

1. Meaning of the Term Factory.—At the last census of manufactures in the United States there were enumerated some 275,000 establishments classed as factories. These range from minor enterprises, employing little more than the owner and one or two assistants, up to mammoth undertakings having many thousands of men on their payrolls. It is very pertinent to ask, What is the distinguishing feature that links together establishments so varied in size and importance? The answer is a simple one: a factory is a place in which material is transformed by the aid of labor, or of machinery, or of both together. It may also be defined as a place in which technical knowledge is applied so as to effect the transformation of original or raw material into a new form. It will be found also that such transformation is effected by technical skill, which may be embodied in machines or exercised by hand. A more complete definition of a factory is, therefore: a place in which, in the light of and under the direction of technical knowledge, material is transformed into a new form, by the aid of technical skill, applied either by hand or by machine.

2. The definition given in the preceding article is, however, still too narrow. For, although it might well cover all the operations of a simple blacksmith's shop, for example, as soon as the work passes beyond such simple stage, the necessity

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arises of embracing within the definition the various functions involved in production. In all but the smallest plants, special activities are devoted to work which is not directly concerned with the transformation of material. Thus, for example, one man, at least, will be engaged in purchasing and the care of material, another will be engaged in registering, dissecting, and doing the paper work of orders, a third will devote all his time to moving material into the shops and fetching away the finished product. All these activities are so many separate services rendered toward actual production, but they are not in themselves production. They do not by themselves transform a single piece of raw material into another form. Nevertheless, they are obviously indispensable. It is evident that an inclusive definition of the factory should embrace these typical functional activities.

3. Services and Functions.—In the sense in which the term will be used in this discussion, a **factory** may be defined as *a place in which material is made over into new forms, by the aid of technical skill directly applied to it by hand or machine, assisted by various indirect services organized for cooperation, under the guidance of technical knowledge.* It is important to bear in mind this definition, as it will serve as a guide in forming a comprehensive view of the relations of the executive toward the factory activities. It will be observed that the definition pictures an organized body, with diverse activities going on simultaneously, but all contributing to one common end, namely, the transformation of material into new forms. An analysis of factory activities shows that they may be reduced to a few clearly marked groups. One of these groups is concerned with direct work on material. All the others deal with the indirect services to production. These activities considered as groups are called functions. Thorough understanding of their scope will enable the executive to get a good grasp on the essential efficiencies to be developed and maintained in factory operations.

4. Value of Accurate Analysis of Functions. Before proceeding to consider production functions in detail,

it may be well to ask whether these definitions have any practical aim, or are merely arbitrary and academic distinctions. The question is best answered by considering a hypothetical case. Suppose that in a certain factory the result of operations is obviously unsatisfactory. Dissatisfaction may be of various kinds. There may be complaints of faulty work; a long list of broken promises of delivery; product may be good, but its cost too high; quality may not be uniform; continual annoyance from errors in carrying out customers' instructions may develop, and so forth. Now if ideas are clear regarding the different factors that contribute to production, the location of faults will obviously be made easier. Take, for instance, broken promises of delivery; whose fault are they? The old-time executive did not know. He simply went out and raised trouble with every one; he fell on the just and the unjust alike. But the modern executive with a clear plan in his mind of the way in which his organized services are working, knows very well where to look for the source of trouble. Very little inquiry will inform him as to where the weakness lies, and he can then apply the necessary remedies without disturbing persons who are not to blame.

5. Scope of Present Discussion.—The subject of factory operation is a very wide one, and several volumes could be filled with a discussion of its problems. In this section, however, attention will be restricted only to such matters in factory management as are of direct interest from the point of view of executive control. It is important, for example, that the executive shall understand the principles of layout of the space and the equipment devoted to factory operations; he must be able to distinguish between the part played by original design and that played by subsequent control in the turning out of product; he must grasp the modern principle of consultative, or, as they are sometimes called, *staff*, functions, and the way in which responsibilities are allotted among the factory personnel; he must know what kind of information to call for, so as to be able to compare the efficiency of one period with that of another; and he must be able to distinguish between

efficiency arising from good organization of services and that arising from successful technical operation. It is to these matters rather than to the detail work of the factory that attention will be given here.

6. Production Functions.—The various points enumerated in the last paragraph, to which the executive must give attention, correspond to what analysis has revealed as the *five organic functions of production,* namely, *design, equipment, control, comparison, operation.* All activities that are strictly factory activities can be reduced to these five groups.

DESIGN

7. First Step.—Before anything can be made, or any consideration devoted to questions of machinery, buildings, staff, etc., it is obvious that plans must be clear as to what is to be made. In other words, something must be designed. Many business failures arise from ignoring this very obvious thing. In proportion as an industry employs specialized machinery, vagueness at the outset as to what class of business is to be done spells failure. In the printing trade, for example, many failures occur either because the wrong kind of machinery for the class of trade undertaken is installed (perhaps because such machinery happens to be available second-hand); or for the reason that, with a given equipment, the wrong kind of business is invited. It is clearly important, therefore, to know at the outset, before a machine is installed or a wheel turns, just what is to be accomplished, or, in other words, what is the *design* in view.

8. Elementary and Complex Design.—The use of the term *design* in the sense of the preceding paragraph is very elastic. In establishing an ink factory, for example, the fundamental thing required in the way of design is a reliable formula. This can be written on a small sheet of paper. Even in this simple case, however, the act of design can not be said to have been completed unless such points as bottling, sealing, labeling, wrapping, and packing have been covered. All these

steps are part of design. It would be very foolish to give out a single contract for the new factory unless all these points had been settled and reduced to working instructions. Even with all this the hypothetical ink factory represents a simple case. Design, in its most complex development, though exactly the same in principle, requires, partly through the multiplicity of detail, and partly through the difficult technical questions that arise, a large well-coordinated staff, or, in other words, a regular department of design. In a mechanical industry, this is represented by the engineers and draftsmen; in a chemical industry, by chemists and engineers combined; in other trades, by technical experts of various kinds with or without engineers. It will easily be understood that faulty or careless design vitiates the whole performance. The most perfect factory system, running like a watch, cannot make up in the slightest degree for bad design. This is a lesson that is often purchased at a great price.

9. Design in an Established Business.—In a going concern design is chiefly concerned with new kinds of product. Some industries, as, for example, the building of large machines, require elaborate sets of designs for each new order. In others, as, for instance, sewing machines or typewriters, of which a large number are manufactured in identical form, design is chiefly concerned with improvements on the one hand, and with special adaptations on the other. In the finishing of textile fabrics, which is partly a chemical and partly a mechanical industry, every new kind of cloth handled requires study and experiment before a decision as to its proper treatment is made. In printing, both paper and ink are sometimes unknown quantities, and experiment is necessary to adapt each to the other and decide on the proper machinery to use. In all these cases there is the same underlying principle: *an ideal or standard product must be fixed in the mind before manufacture is begun.* In a mechanical industry the end in view is the production of a mechanism that will do some specified task; in a finishing business there is a customer's sample of shade or finish or both to be duplicated; in a printing concern some

specified effect is usually sought, often dependent on a sample also. Even in a plain piece of printed text, there is always the standard of the house to be attained. For, as any one knows who has bought printing, the same text, in the identical type and on the identical paper, will have a very different appearance when turned out by one printing house and when manufactured by another.

10. Design as Product Specification.—Design indicates the aim to be attained with more or less definiteness according to the needs of the case. It follows that design also indicates tests. A piece of steel must be machined to certain dimensions, and must pass certain limit gauges. A piece of cloth must match a sample piece in color and texture. Even in the simple case of the ink factory, it is desirable that suitable tests or standards should be indicated, such as fluidity, color, light-fastness, etc. Design therefore embraces, first, the shape, size, dimensions, surface, color, or other physical properties of each component of the product and of the product as a whole, and second, the tests to be applied to insure that this specification has been complied with. It should not be lost sight of that design is in all cases a technical function. It demands technical knowledge, not only of the uses of the product but also of the productive operations (which are the application of technical skill to material) and of how these can be made to bring about the desired changes in the raw material. While the principles of control, comparison, and equipment are common to all industries, design and operation are essentially technical.

11. Responsibility Resting on Design.—This is the first application of analysis of functions that the executive must keep in mind: Design must bear its own burdens; it cannot pass them on to other functions for remedy. This applies in many ways. A clumsy design of a machine part costs money; there is no remedy but simplifying the design. If a mechanism fails to perform its expected task, the first thing to investigate is whether it was, in fact, made exactly as specified; if so, the failure lies in design. A batch of ink is

found to thicken in the bottle. Was the specification of materials and processes (which may include such things as temperature and purity of water) faithfully carried out? If so, the design, that is, in this case, the formula, is the thing to be critically examined. Is a certain line of goods costing more than was estimated, and if so, why? If the answer is: because it is necessary to take special precautions to keep the material cool, or prevent it buckling, or keep it from sticking—then this was a condition unforeseen in design, and the design is the thing that requires attention. The importance of knowing where design begins and ends is thus manifest. No rules can be given regarding this. The line of demarcation varies from industry to industry and from plant to plant. But every executive should plot out for himself just where his function of design starts and ends, and must make sure that every step of it is in competent technical hands.

EQUIPMENT

12. Range of the Equipment Function.—Equipment is defined as the function which establishes conditions for production. It thus embraces the planning and provision of buildings, power plants, transportation appliances, and the machinery used in actual operation. In establishing a new business, the question of equipment naturally follows on that of design. Having obtained a clear idea of what is to be made, the next step is to provide the physical equipment for making it. A good deal of designing is involved here. Such designing is not, however, to be considered as part of the specific function of design, because that function has to do with designing the product only. The subject of the planning of equipment, including the layout of buildings and machinery, has only of late years obtained adequate attention, but has rapidly come to be recognized as a very important feature in good management. The necessary equipment having been planned and provided, there still remains to be arranged the upkeep and running of such equipment, and the furnishing of power, lighting, ventilation, sanitation, fire prevention, sprin-

kling, repairing, and maintenance services, all of which is included in the function of equipment. As all these things are matters of engineering, equipment may be considered as the engineering function. It should be noted that the function of equipment *makes* nothing. It adds nothing to product *directly;* all it does is to establish and maintain efficient conditions under which operation, that is, direct work on material, may take place.

13. Problem of Buildings.—Before anything else, buildings must be provided. Unfortunately this necessity frequently leads to very hasty decision as to the kind of building acceptable, with results that bear bitter fruit in later years. Nearly every firm of more than twenty years' standing, and many younger ones, can supply an example of this. In old times, as may be seen anywhere in country districts, the idea that a factory would expand was quite generally ignored. In many sections of the country mills are found built of stone, very much like large private houses, with small windows and solid walls, and mostly without the slightest provision for adding extensions of any kind. At the time these were put up, the prevailing type of factory building was a simple box of stone, brick, or wood, of one or more stories, and the idea that different kinds of industry might with advantage use different types of buildings, was almost unthought of. Today the idea of planning the building to meet the requirements of the industry, instead of forcibly cramming the necessary equipment into a stereotyped building, is pretty generally accepted. An executive about to take charge of a new project must make it his special task to look after the adequate planning of buildings, once the design of product has been decided upon, together with the operative machinery that it implies.

14. Layout of Machines.—The selection of operative machinery goes hand in hand with the design of the product, where an industry is being started. The specific design will, or should, depend on specific machines being employed. Therefore it may be assumed that a schedule of the required machinery is at hand. The next question is, How should this

machinery be arranged? A rough idea of the sequence of operations is necessarily impressed on any one who is planning a new industry. But modern analytical methods have shown that many points should receive careful consideration. It is not simply a matter of fitting machines into a given space like a jig-saw puzzle. Certain principles must be observed. The first of these has to do with the path of travel of material in process. A cardinal principle of modern management is to avoid handling material as much as possible. Every handling costs money and involves delay. But unfortunately there are also opposing considerations, so that every problem must be solved individually after all the circumstances have been weighed.

15. Straight-Line and Group Layouts.—In many industries there is no question whatever as to the manner in which machines should be arranged. The layout is dictated by the fact that processes are continuous, and that there are no alternatives to choose from. In such a process as soap making the product passes through a large portion of its career in liquid form; it is simply pumped from one tank or vat to another. The raw material, tallow, oil, etc., is also piped in a molten state. Steam, hot water, and caustic soda are similarly handled. The by-products, such as glycerine, are also piped. In such circumstances the relative position of departments, and even to some extent their distance apart, are not matters of prime importance. It is only after the soap has become solid, in the drying, cutting, tableting, wrapping, boxing, and storing stages, that layout becomes of vital interest. But in another class of industry, especially in machine work, the desirability of so disposing operations that the product passes from one machine to the next immediately adjacent is often more or less in conflict with the requirements of technical supervision and maintenance. If fifty machines of one kind are placed in one room an expert can be put in charge of them all, thus insuring the best results both as to quality and quantity; special repair men, qualified experts in keeping just that type of machine in the best condition, can also be

attached to such a battery of machines. But if the fifty machines are scattered about the plant in groups of, say, ten machines, evidently there is a loss—it may be an unavoidable loss—of efficiency.

16. Compromise Between Possible Arrangements. Two ways in which the problem stated in the preceding article

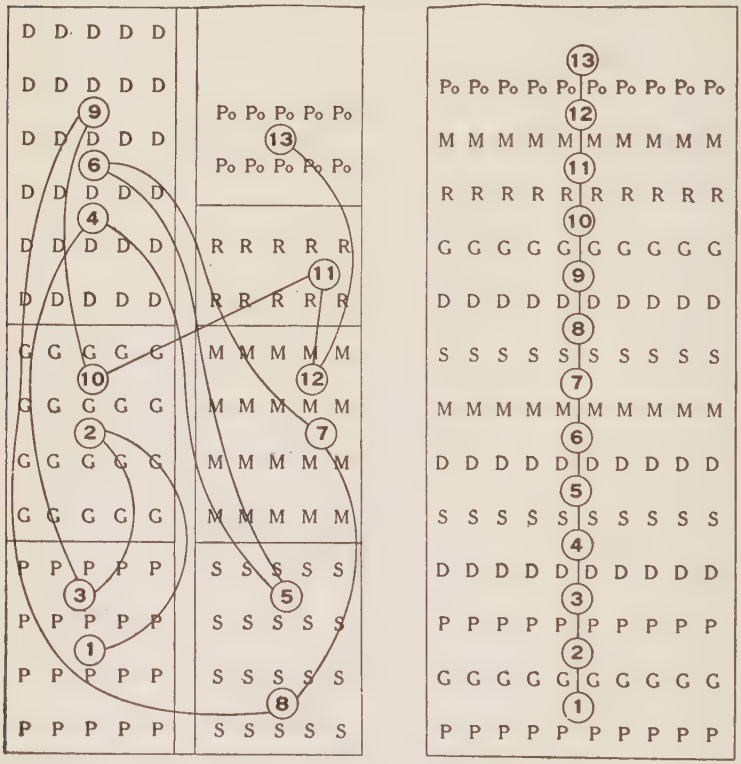
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Fig. 1

can be solved are illustrated in Fig. 1. On the left is the grouped or *departmental arrangement* of machines. On the right is the *straight-line arrangement* of the same number and variety of machines. From what has just been said it will be seen that while advantages in the way of supervision and easier upkeep are sacrificed by the straight-line arrangement,

on the other hand, great advantages with regard to movement of product are gained. On the grouping plan it is evident that considerable time and expense will be absorbed by the mere moving of the material from one department to another, whereas in the straight-line plan a regular and orderly progress of material takes place, possibly without involving any charge for moving at all.

17. Which then of the two foregoing plans is the better one? No answer can be given to cover all cases. One factor is the size and weight of the parts to be handled, another the actual amount of skilled supervision demanded by each type of machine. Individual problems must therefore be worked out and the arguments for and against duly weighed. One thing may be noted, however. If it is not certain that the product will always follow the routing as laid down in the straight-line plan, or if it is probable that some day new processes may have to be inserted in the routine, then preference will be for the departmental method, other things being equal. The grouping plan is absolutely flexible. Product can visit each group of machines in any order. On the other hand, the straight-line arrangement is very inflexible. Any departure from the natural routine will cause a great deal of confusion and inconvenience.

18. Principle of Minimum Travel.—The glimpse given in the preceding articles of the problems involved in lay-out will suffice to show that these problems are not to be glibly solved by a hasty sketch or a half-hour's discussion. Upon due and careful consideration of the facts involved much of the future efficiency of working will depend. Furthermore, having determined the arrangement of machines within each department, the relations of these departments themselves must next be considered. For just as the principle of minimum travel of material within a department is important, so also does the same hold true as regards the factory as a whole. Departments should be so located in reference to one another and to the source of raw material (stores) and to the warehouse for finished material (the stock room) that the path of travel

is as short as possible. Naturally this question of layout is much more important in some industries than in others. In industries dealing with heavy materials and articles it is very important; in others, dealing with bulky stuff where, however, movement can be controlled by mechanical appliances, layout is less important; in industries dealing with very light goods, layout will be important in proportion to the volume carried between departments. In industries in which movement is controlled by liquid transportation, the layout is sometimes of very small consequence. Nevertheless, as a general rule to be observed, unless there are clear reasons why the principle should not apply, it may be said that departments should be arranged with a view to minimum travel of raw material and finished or part-finished product.

19. Desirability of Keeping Expansion in View. Another factor that must not be lost sight of is the prospect of future expansion of a projected plant. In many cases this feature is ignored in the making of plans. Various reasons may be assigned to account for this. One is the influence of the architect, who has a strong bias in favor of a building or set of buildings complete at all points. Another is the fact that at the time of construction attention is being focused on a plant well adapted for present uses, and that this is considered to be a sufficient problem for the moment. The result is, too often, that a handsome, architecturally adorned, absolutely inflexible type of building is erected, into which the required machinery just fits and no more. A few years later, if the business is successful, it is suddenly discovered that there will be the greatest difficulty to provide extension without great expense, and even then the layout of the factory as a working unit will be altogether changed, probably not for the better.

20. Expansible Layout in a Heavy Industry.—In plants employing large and heavy machinery, arranged by departments, and especially where it cannot be foreseen which of several departments will grow the fastest, the type of building shown in diagrammatic form in Fig. 2 is advantageous.

This is a type of building which originated in the English textile industry. On the south side of the main alleyway will be seen storerooms for goods in process, each of which serves the department immediately opposite. On the north side are the productive departments, one-story buildings lighted by monitors or saw-tooth roofs. Raw material is delivered into the first storeroom and taken as required into department *A*. The part-finished product from *A* is delivered into the *B* storeroom, thence into department *B*, and so on. One point to be noted is the flexibility of delivery to any department. Thus

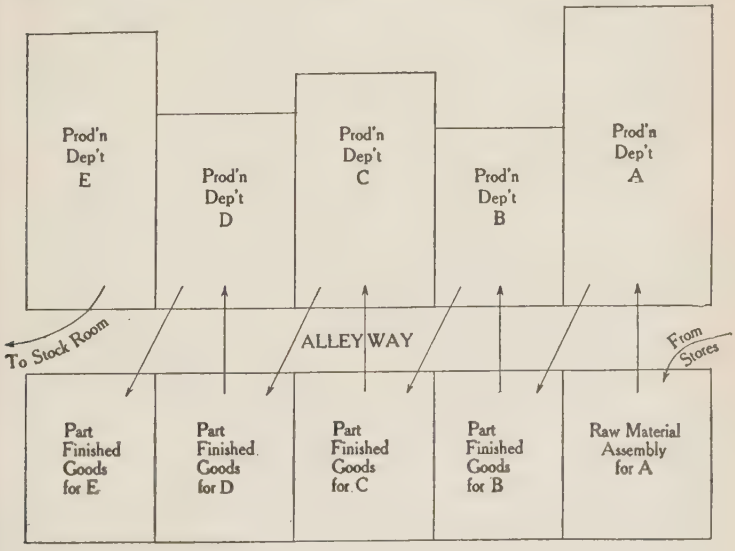

FIG. 2

it may be that some product does not pass through all departments from *A* to *E*. It may follow the series *A, C, D, E* or *A, B, D, E*. Or it may, in some cases, turn on its tracks, and be routed *A, B, D, B, E*. But any one of these routings is as easy as any other. The other important advantage of the plan is that each of the departments *A, B, C, D,* or *E* can expand indefinitely at its own rate of progress, without interference with other departments. In some kinds of business this is a very important feature.

21. Example of Growth of Plant.—The illustration in Fig. 3 shows how easily the type of layout just described lends itself to expansion without alteration of the general plan. The storeroom and stock room and their loading platforms, shown by solid lines, should be considered as part of the original layout. From an examination of the diagram it will be seen that: (*a*) a new productive department has been added; (*b*) the old productive departments have been extended northwards, each according to its own requirements; (*c*) the stock rooms for part-finished product have been enlarged and extended to meet the larger production, and a new room has

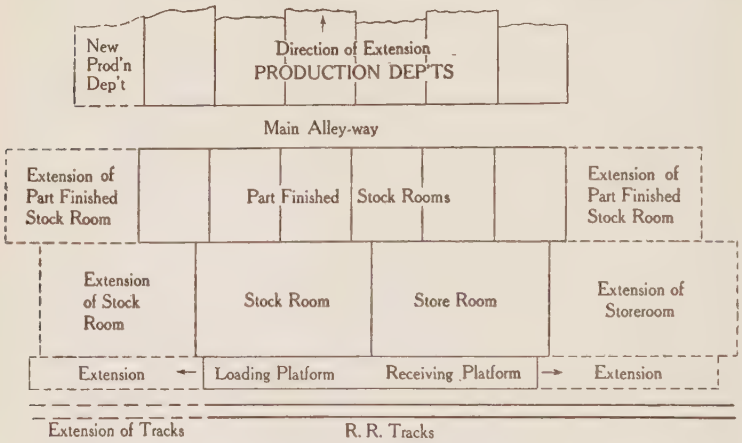

Fig. 3

been added to take care of the new productive department; (*d*) the storeroom and the stock room have been extended in accord with the increased capacity; (*e*) the loading platforms and tracks have likewise been extended. Now the main thing to observe is that all this extension has taken place without impairing the excellent layout of the original plan. This is an example of a thoroughly flexible layout, and though this plan cannot always be copied, and though each problem must of necessity be handled on its own merits, the illustration here given is an example of what any plan should aim at, in such industries as are best housed in single-story plants.

22. Light Manufacturing in Multiple-Story Plants.—It will be readily seen that the plan described in the preceding article could not be utilized in a building of more than one story, as it is dependent on top lighting. Where buildings are to be constructed of two or more stories, an arrangement like Fig. 4 may be considered. The plant may begin with one story, precautions being taken to have foundations, columns, etc., constructed so that they will carry several stories ultimately. This does not involve great extra expense if planned from the commencement, while to strengthen such members afterwards is a difficult and costly operation. The general idea, as will be seen from the diagram, is to circulate

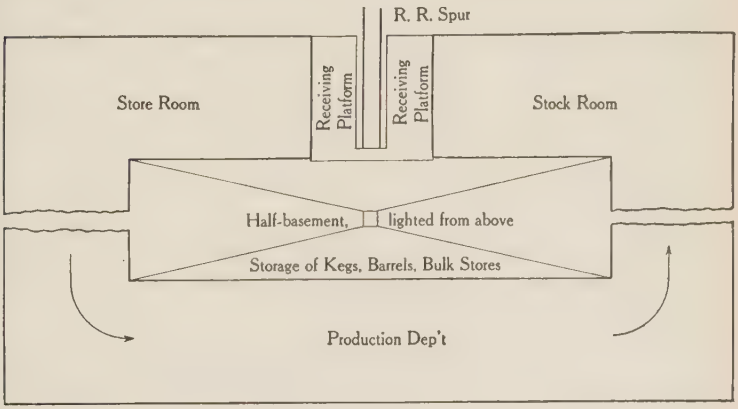

FIG. 4

material from the storeroom through the plant, into stock room, and thence to the loading platform at the tracks. The building will probably be square, with an interior court as shown. The ground floor of this court can be made into a half basement, lighted from above, and used for storage. When extension becomes necessary, it is provided by adding a new story or stories. This may be done several times, up to the limit originally decided by the nature of the foundations. With each addition, the circulation plan, or layout, remains the same. Each new floor is, in effect, a doubling of the capacity of the plant in all its functions. Lighting remains the same. The

floors will naturally be connected by capacious elevators, judiciously placed. Great care should be taken to construct elevators large and strong enough to carry elevating tractors. The problem of handling material will then not increase in difficulty as the plant grows.

23. Other Construction Plans and Layouts.—A type of multi-story building that possesses great flexibility, though not perhaps capable of such architectural finish as that described in the preceding article, is shown in Fig. 5. It consists of a main building *A*, with a series of wings *B* on each

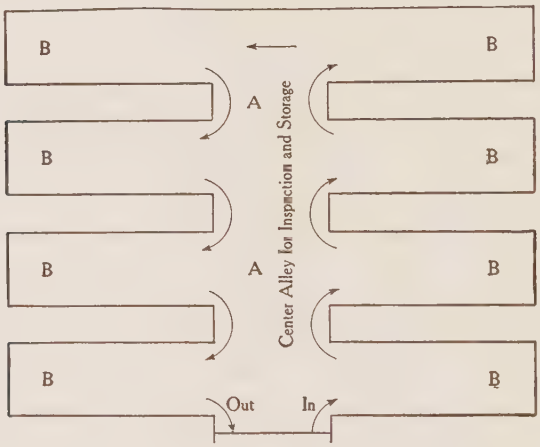

FIG. 5

side. Access to storerooms and stock rooms (not shown) is at one end. The path of travel of material is down one side, in and out of bays, and up the other. Flexibility is preserved by the possibility of extension of the main building *A* with additional wings, or by adding more floors. The wings are in general devoted to manufacturing processes, and the main building to inspection, assembly, tool rooms, storage of part-finished product, etc.

24. Radial Type of Building.—The radial type of construction, shown diagrammatically in Fig. 6, crops up every now and then as offering advantages for plant layout. The

idea is that the shops are situated in the spokes of the wheel and the storerooms in the hub. Extensions of the spokes can go on indefinitely, without interfering with the lighting. Not much can be said for this plan. It is obviously very wasteful of space. The longer the spokes, the more ground is wasted. Moreover, there is no possible way in which the central space or hub can grow; hence, a condition of congestion will inevitably follow sooner or later at that point. The plan is one well-adapted to prisons, where it is frequently adopted. The

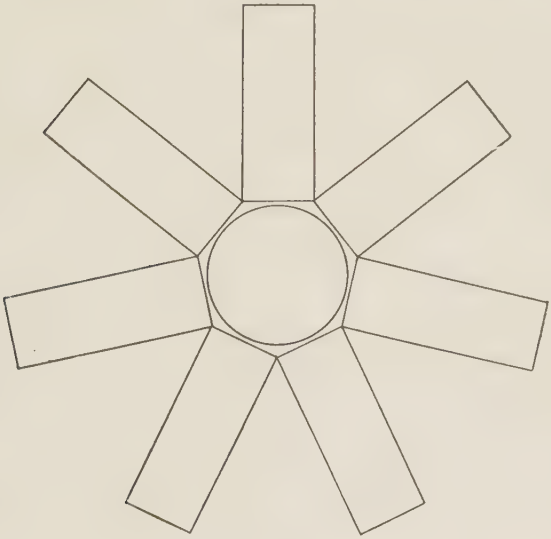

FIG. 6

advantage here is that all the wings or spokes open only into the hub or central space; hence, only this space requires watching. There is nothing corresponding to this in industrial plant economy.

25. Other Branches of Equipment Layout.—It has been shown that the executive must have a clear plan in mind as to: (*a*) what is to be made; (*b*) the machines by which it is to be made; (*c*) the plan on which such machines are to be installed and the routing to be followed by the material

in each department; (*d*) the housing of departments in suitable buildings, so as to allow for expansion while preserving the original relations of one department to another. These are the more important items with regard to equipment to which the executive must give close personal attention. Other points of equipment are more of the nature of engineering matters, which will follow routine engineering practice in most cases. Plans of lighting (both daylight and artificial), heating, ventilation, fire protection, sanitation, and hygiene, all have to be laid out and arranged to the best advantage, but they do not offer any specifically executive aspect. The subject of transport methods is too large and special to be treated here; it will suffice to point out that some industries have had a variety of special conveying and handling appliances developed for them, while others as yet await such development. But this is a problem of engineering rather than of executive activity. The executive should, nevertheless, keep closely in touch with progress in this field.

26. Power Plant.—The selection of the components of a power plant is also obviously a technical and engineering problem. But there are certain requirements which should be studied by the executive and impressed on the technical designers. Ample capacity for the peak load, and when possible, ample margin of reserve to cover possible breakdown of units of the power plant, are among these. Another very important point, often overlooked, is provision for expansion without undue expense. Questions of policy will also arise in regard to the size of units. Large units are the most economical, but on the other hand several small units, with a provision for idle or spare units, are safer. Breakdown of a large unit stops production altogether. Where small units are concerned, a single breakdown can be taken care of by an idle unit, while it would be financially impossible in most cases to provide a duplicate large unit as a reserve. Just what is done in this matter will depend somewhat on the part that power plays in the total cost of operations. In some cases, power and steam make up a large fraction of the total cost of production, and

then the most economical system of power and steam generation must be adopted. In other cases, power is a comparatively trifling proportion of total cost, and then it may be well to sacrifice something of economy in favor of safety from breakdown. Each case must be decided on its own merits.

27. Expansible Power Plants.—What has been said on the subject of expansible factories applies no less to the power plant. Probable expansion of the one implies probable expansion of the other. Consequently, power buildings should be so designed that additional units of all kinds can be added without disturbing the original layout of the power plant. The small unit system offers advantages in this connection. New units of similar size can be added concurrently with every enlargement of the productive departments. Shortage of power must be most positively guarded against, since it is an insidious failing that drags down efficiency in all departments, and disheartens everybody, because there is no possible remedy for the troubles it causes. A properly equipped power plant, of ample capacity, and arranged with due precautions as to possible breakdowns should therefore be a particular care of the executive who is planning a new industry.

28. Running of Equipment Service.—The equipment function includes not only the installation of equipment, but also the maintenance of the services provided. The equipment function includes the selection, installation, and running of all the physical equipment. By this is meant, in practical language, that the engineering department undertakes power supply, lighting, heating, fire service, etc.; also all maintenance and repair work. It keeps not only its own machinery in running order, but also that of the operation function, that is, the productive machines. The executive's relations to these duties will lie chiefly in the examination of reports and returns which will keep him informed as to the efficiency and cost of the work done by the engineering department.

29. Plant at Work.—The discussion so far has been regarding matters antecedent to actual production. Design has been discussed, and its influence on all later stages of work-

ing. Equipment has been considered, and the necessity of its proper arrangement or layout. The next step will be to consider how design is translated into actual goods, and how equipment begins to move, wheels to turn, and orders to be fulfilled. This study will include, first, a brief glance at the function of operation, whereby technical skill is applied to material, usually by the aid of machines; then will follow a review of orders as they set all activity in motion (function of control). It will further be necessary to consider how records and comparisons are made so as to insure that designs and orders have been properly fulfilled, and to ascertain what it has cost to do this (function of comparison). Finally must be considered the nature of the data to be put before the executive in order that he may be assured that everything is proceeding smoothly and efficiently.

OPERATION

30. Function of Operation.—Operation, whether by hand or by machine, is at all times a technical matter; that is, it involves the application of skill to material for the purpose of production. It is the function (along with that of design) that differentiates one kind of business from another. The principles of equipment, control, and comparison are common to all plants in greater or less degree. A shoe factory, a soap works, a typewriter plant, a textile mill, all employ similar principles in organizing these functions. But operation in these various plants is totally different. It involves different kinds of skill, and generally, though not necessarily, applies them to different kinds of material. Operation is trade skill and there is little more to be said about it.

31. The Executive Viewpoint.—From the executive viewpoint, however, one or two things of importance must be considered. In a given plant there are always a number of different kinds of skill necessary at different stages of production. These may correspond to different kinds of machines, or they may be forms of manual skill. If such skill can be made

fluid and transferable, it is a very good thing. Trade-union rules prevent this in many industries, but where it can be done, it is advantageous to train operatives to do two or three kinds of work so that they may be transferred from one operation to another as occasion demands, instead of being laid off. Another consideration is one of policy and should have been discussed, properly speaking, under the head of equipment, but as it has to do with skill it will perhaps be understood better at this stage. In some industries a choice exists between what may be termed *general* machines and specialized machines. A milling machine (in metal working) is an example of a general machine. The same type of machine, specially constructed for machining some one automobile or sewing-machine part *only*, is a specialized machine. The point is that a general machine will usually do all that a specialized machine of the same type can do, but not so economically. Which is to be installed? When is a specialized machine to be preferred to one of the general type?

32. General or Specialized Machines.—The answer to the question raised at the end of the preceding article is not easy to give, and, in fact, many catastrophes in the business world have arisen out of just such a problem. Hand operative skill can be changed rapidly, by the simple process of firing and hiring, but not so machines. They represent locked-up capital, and, if they cannot be kept at work, represent a dead loss. As a general principle, specialized machines should not be installed unless there is practical assurance that they can be kept working to their full capacity. This implies a continuous flow of business of precisely the kind that the machine will do. If there is doubt of this, then it will be better in most instances to set up a general machine to do the work, even though it may be less economical. The whole business, however, goes far back to the original question of design. The prospective manufacturer must know clearly what he is about. Then, having settled exactly what line of work is to be taken up, let him abide by that. Let him not seek or accept business for which the plant is not perfectly fitted.

33. Operation the Only Money-Earning Function. The executive will do well to get this fact well fixed in his mind: Money is made nowhere else than in the operative department. All the other functions, with all their array of buildings, machinery, experts, engineers, busy staffs, and constant expense, are simply the servants of operation. Themselves, they make no money, they only establish conditions under which operation may earn money by turning out salable product. The next thing for the executive to fix in his memory is the slogan *Keep the machines at work.* An idle machine is a missed opportunity. An idle machine is a constant reproach to the foreman, to the planning department, to the sales department, and, not least, to the executive. To which of these it is the worst reproach depends on why it is idle. It may be stopped for repair, or because no man is available, or because some cog has slipped in providing it with work that is available, or because there is no work for it. Each of these cases implies a reproach to a different individual, but a succession of such cases, a considerable percentage of idle machines from whatever causes arising, implies a reproach, and a grave one, to no one more than to the executive. This matter will be referred to again when considering the subject of reports for the executive. Few plants, except those organized on modern lines, have any true idea of the time lost in idleness by their machines.

CONTROL

34. Function of Control.—Having considered equipment and studied some of the principal aspects of the two technical functions—design and operation, the next thing to take up now is the problem of control; to show how, by virtue of control, the plans laid out by design are translated, through the efforts of operation, into finished product. And this leads at once to the subject of orders. Control is emphatically the function of orders. The plant is lifeless, as far as operation is concerned, until an order starts things up. But it will be

at once suggested that an order is a lifeless thing also. This is true. Therefore under the head of control must be considered not only the nature and routine of orders, but also the living factors who give out orders, handle them at every stage, and carry them out in detail. This is a matter of staff organization. It will be understood that a design and an order are two very different things. A design is merely a plan. It may exist without ever being carried out—no inconsiderable percentage of designs meet just that fate. But an order is, as it were, a definite push to start the wheels. It is an executive act, pure and simple, whereas a design is a technical proposal only. Design shows what is wanted. Orders set people and things in motion to carry out the plan indicated by the design.

35. Layout Problems of Control.—Just as layout is the fundamental basis of plant arrangement, so it will be found that successful control depends upon layout. In the first place there is the layout of staff relations, or, as it is often called, *staff organization;* and secondly, there is routing, or order control, which is in effect a layout of the path to be taken by material in its progress from the raw stage to finished goods. Both of these are big and complex subjects that can be presented here only in outline, from the side of most interest to the executive. This complexity is not found in equal degree in all types of plant, it is true. Some plants have hardly any staff organization and practically no routing, and this statement refers not merely to defectively organized plants. Some industries are so simple that they have absolutely no need of the complex organization that is justifiable and necessary in others. The first step here, will be, therefore, to discuss the conditions under which the simple and the complex type of organization, respectively, is called for.

36. Simple and Complex Control Systems.—The main object of a control system is to take care of orders, such orders representing salable product. The complexity of control will therefore depend in a great measure on the relation that orders bear to the output. In continuous industries, where product of a perfectly homogeneous character flows out

from the plant in a regular and uninterrupted stream, so that no one portion of it is any different from any other, the simplest conditions are presented. In such case there is practically only one order to handle. Individual customers' orders never get to the plant at all. The product is, as has been aptly said, "made by the mile in the plant, and cut into foot lengths in the stock room." The control system in such a plant will be very elementary. The opposite of this is found in those industries that work on a multitude of small individual customers' orders, no two of which are alike. A third case is that of a factory making things like typewriters, or other comparatively small mechanisms, where, though there may not be many ultimate patterns of product, there are a multitude of separate parts, hundreds of separate assemblies (that is, groups of parts fitted together), and a vast volume of intricate transactions, all of which have to be produced or carried out on an exact time schedule, so that they will meet together in unison.

37. Small-Plant and Large-Plant Control Types. The discussion of the preceding article is based on the supposition that the plant is one of considerable size. The control methods adapted to small plants will in general differ greatly from those appropriate for large plants. In the latter, functionalism, that is, the fine subdivision of duties, and their assignment to different individuals, can be carried out to full extent. In the small plant the scale of operations does not permit this. One man must perform several functions. While nearly all the attention of economists has been focused on the problems of the large plant, as a matter of fact only 2 per cent. of the factories of the United States employ more than 250 persons each. Upwards of 270,000 factories employ less than 250 persons, the average being 14 each. The small plant is, therefore, no inconsiderable factor in industry, and the type of its organization is important accordingly. The factory employing 100 persons or less is necessarily obliged to restrict its staff operations, because otherwise its overhead would eat up all its profits. A proper balance must be observed in this, as in all things, in planning the personnel.

38. Small-Plant Organization.—An average layout of staff arrangements in a small plant is represented diagrammatically in Fig. 7. The plant operations are managed by a superintendent who is directly in touch with the executive. All the business of the plant passes through his hands. Directly under him are his foremen and repair men, with probably a man in charge of stores, who may also take charge of finished goods and see to their despatch. No regular arrangements are made for transporting material or product. Perhaps there may be a laborer who does this work among other duties. The man who has just finished a job passes it along to the next

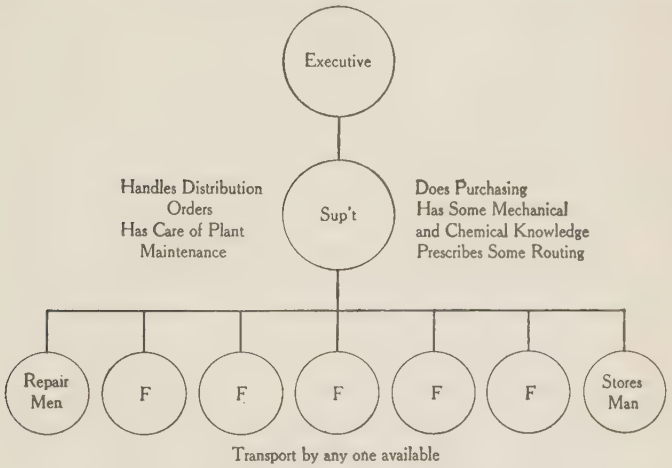

FIG. 7

man, or the man who is short of work looks around till he finds some ready for him. The superintendent is a busy man, full of detail. He receives customers' orders from the executive, arranges for the various components to be made by the foremen, sees to the ordering of material, makes a rough scheme of the order in which parts are to be turned out, and indicates some approximate time at which he expects them to be ready. He also sees to it that the equipment is kept in running order. Such a man has usually a good technical or trade knowledge, and he is a master of operation, but his knowledge runs in a narrow groove; he cannot branch off or strike out new lines

easily. Nevertheless, in a very small plant this state of affairs will often produce excellent results. Operations are all in sight. A few minutes spent in walking round the plant will put the executive and the superintendent in touch with the status of every order. No elaborate system is necessary.

39. Providing for Future Conditions.—As long as the plant remains small, the arrangement described in the preceding article will work well, provided energetic and reliable men are running it. But many businesses grow, sometimes rapidly. It is commonly the case that the same system is kept up for years with very little alteration, until some one dies or leaves. It may be that the executive sells out, or the superintendent goes; or the man leaving may be some one who is not officially entitled to such rank, but who is virtually the king-pin of that plant. Whoever the person may be, it frequently happens that one man's disappearance from the scene will bring up the plant's affairs with a jerk. If the plant has grown rapidly this may cause a severe setback, unless the opportunity is seized to reorganize on modern lines and functionalize the undertaking. But such action is hardly ever taken until it is forced by some untoward event that threatens the welfare of the business.

40. Layout of Functionalized Staff Organization. From what has been said on the diverse nature of operations in industrial plants, it will readily be inferred that there is no fundamental or obvious type of staff organization suited to all cases. Between the elementary small-plant type described and the organization of a plant employing several thousand people, there is a long range of intermediate types. There is no best type, though the contrary assertion is sometimes made. In Fig. 8 is illustrated an average type of plant staff organization. The affairs of the plant are under the control of a plant manager, who may be a vice-president of the company. Under his jurisdiction are the principal plant officers, namely, the superintendent (or superintendents) of operation, the purchasing agent, the storekeeper, the order and routing office, the plant engineer (in charge of equipment), and the chemist or other

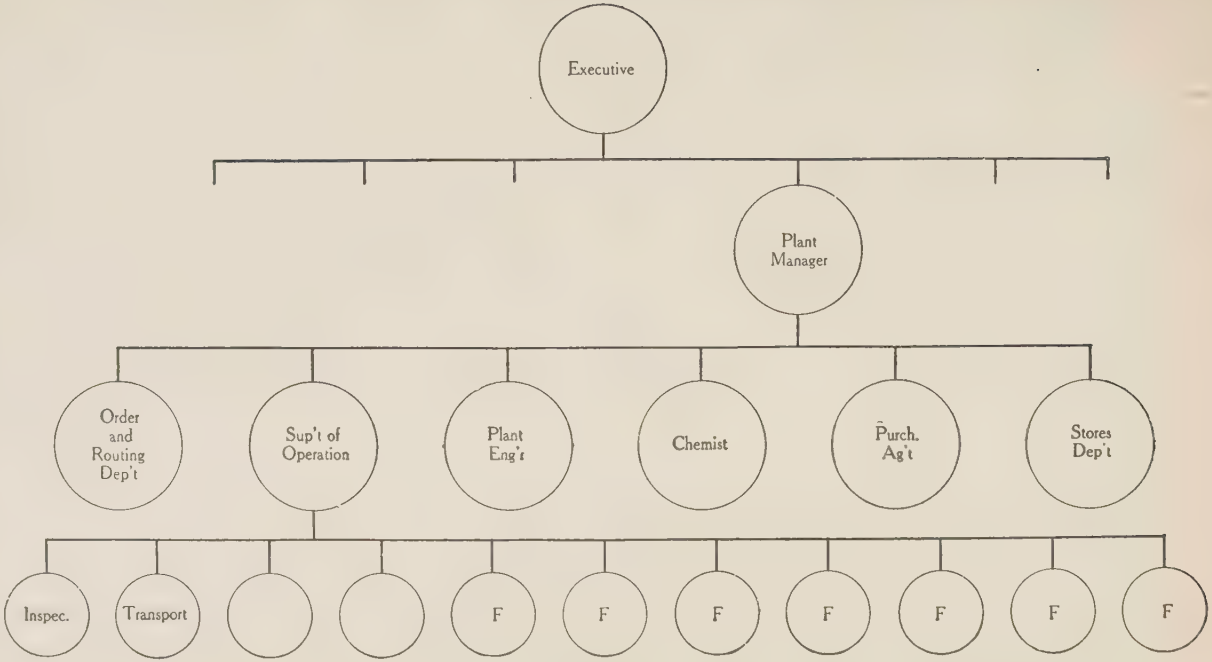
Executive
Plant Manager
Order and Routing Dep't
Sup't of Operation
Plant Eng'r
Chemist
Purch. Ag't
Stores Dep't
Inspec.
Transport
F
F
F
F
F
F
F

FIG. 8

technical expert. Under the superintendent are the various foremen, also the inspectors and the transport staff. It will be observed that the essential difference between this layout and that of the small plant is that the duties exercised by the superintendent have been decomposed or divided up and allotted to special men, namely, the care of orders to the order office; the care of equipment, including repairs, to the plant engineer; the care of purchases to the purchasing agent; the care of material to the storekeeper; the exercise of highly technical knowledge to the chemist or other expert.

41. Devolution of Duties.—The splitting up of functions and assignment of special duties to separate individuals is a typical process in the growth of a plant. It is called **devolution.** In a very small plant, say a blacksmith's shop, all the functions are exercised by one man. As the business grows he sheds duties one by one, till one day he is perhaps the president of a million-dollar corporation and all his routine duties are being performed by others. This process is very important to observe, because it is the true path of development in a growing organization. It can be applied in any type of business. But it must also be remembered that with every such devolution arrangements must be made for harmonious working. Therefore, in the instance illustrated, if the office of superintendent of operation is regarded as corresponding to that of superintendent in the small plant, then, in order to regulate the team work of the new officers, a plant manager is placed above all of them. His duty is to coordinate and harmonize their work so as to contribute to a good general result.

42. Consultative Relations of Staff Organization. In Fig. 9 are illustrated in diagrammatic form the relations of the group of officers shown in Fig. 8. The lines running across the diagram represent so many different functional exchanges between the men. They also represent the different lines of thought running in the small-plant superintendent's head, at any rate to an elementary degree, before the duties were devoluted on separate officers. From an examination of this diagram the reason why the small-plant type of organ-

PLANT MANAGER
PURCH. AGT
STORES DEPT.
SUP'T OF OPERATION
PLANT ENG'R
CHEMIST
ORDER AND ROUTING
INSP.
TRANS.
Mechanical Specification
Chemical Specification
Mechanical Tests and Improvement
of Handling Methods
New Equipment
Repairs and
Chemical Tests
Maintenance
Improving Transportation
Methods
Improving Processes
Inspection Standards
Routing for New Kinds
of Work

Fig. 9

ization must burst its bonds sooner or later will be understood. It is not necessary to go over the items of this diagram in detail, as they will be understood from an inspection. Each line represents a specific kind of consultation between officers. Thus, to take one case only, the superintendent consults with the plant engineer with regard to new equipment and to the upkeep of the existing equipment; with the chemist or other technical expert on the matter of improving processes of operation; with the order office on the question of routing new varieties of work. The examples shown are only typical, and not exhaustive. The details will naturally vary from plant to plant.

43. The Executive and the Organization Layout. In seeking to improve staff organization the executive will keep in mind the principles referred to in the foregoing articles. Though he may not be able to devolve each separate duty on a different man, unless the plant is a large one, yet it should be possible so to lay out the organization, that the appropriate combinations of duties are consolidated. Thus, purchasing and storekeeping may be under one head. The superintendent can also be the plant engineer. Chemical or special technical knowledge, being infrequently called for, may be supplied by the executive himself, if qualified. But careful watch should be kept to see that this doubling up of duties does not lead to one set of them being inadequately performed. A man who is forced to divide his attentions between two or more duties can hardly give the best service of which he is capable. For good results he needs to concentrate his attention. By relieving him of irksome and ill-advised duty, devolving it on another, improvement can often be brought about. Layout of organization is, in brief, fitting the jobs to the right men, so that the knowledge and experience of each is utilized to the maximum advantage. A clear idea of the functions to be performed will greatly assist in planning this.

44. Control of Orders.—After this survey of the way in which the duties of control are devolved on certain individuals, the next subject for consideration is that of orders. The whole object of a business organization is to push orders

through promptly, accurately, and effectively. It has already been noted that orders may form a complex or an exceedingly simple system. In a paper mill turning out only one kind of paper, there are no orders, or, theoretically speaking, there is one continuous order, lasting through a certain financial period, say a week, or a month. There is no routing to be done, since the operations have a fixed sequence, and cannot be varied in any way. The only orders are customers' orders, but these have nothing to do with the factory as such, since the product is the same for all customers. The only thing approaching an order would be an instruction to the factory to turn out product at a certain rate, assuming that it was not already working at full capacity. In such a plant most of the usual elements of control are wanting; there are no orders, no routing, no tracing, and no planning. It is impossible for production to get out of balance by the production of more of one component than will suffice to meet other components, for all processes work simultaneously and in sequence. Between this simple kind of industry and the most complex kind there is an enormous difference.

45. Intermediate Type of Order Control.—A printing plant presents an example of an industry dealing with large numbers of orders, though in no way representative of extreme complexity. Most printing consists of process work done on one kind of material. There is first the design, in the shape of the customers' copy. Material (paper) has to be provided either from stores or by special purchase. Type has to be set, by either hand or machine. The accuracy of the typesetting is first ascertained by proofreading (corresponding, in the general scheme of industry, to inspection); then the paper is issued from stores and the job is printed from the type. The sheets pass through cutting machines, and may be folded and stitched. The product is then passed to the stock room for delivery to the customer. Now, it will readily be seen that a number of undesirable accidents may happen to the order if precautions are not taken in advance. The wrong paper may be used, or the wrong type, or the wrong ink. The

paper may not be forthcoming when wanted. It may be printed on the wrong kind of machine, either wasting time or producing a poor result. It may be cut or folded wrong. It may be kept waiting too long for its turn at the press, or at the folding machine, and so on.

46. Control as Regulator of Production.—It is for the purpose of systematically preventing errors and accidents in the filling of orders that order control is instituted. In addition to this, control is also necessary so that it may be possible to know just how far any particular order is advanced toward completion. Paper-mill control, which has been referred to as an example, is simple, because of the relative absence of opportunities for misadventures to an order. In proportion as such opportunities become more numerous, a more extended system of control becomes necessary. As soon, however, as all misadventures and accidents are duly guarded against, any further control is worse than valueless; it becomes mere red tape. The executive should bear this in mind as a touchstone for proposed innovations. The maximum complexity in control is reached in plants where the final product is made up of a large number of parts that arrive at the final assembly not singly, but already combined in numerous subassemblies. A typical example of this kind is seen in automobile manufacture. Some parts are here made in enormous quantities; some are purchased; partially assembled combinations are made and held in large numbers in stores; while some parts are almost individual to one specific order. If misadventures may occur in a printing plant by the dozen, in an assembling industry of the extreme type they can happen by the thousand. Consequently, in such industries control is being reduced to a science. The whole plant tends to move like a well-regulated clock.

47. Principal Items to Be Controlled.—To insure the putting through of an order without mishap, the following things usually have to be considered: (*a*) The design, which may be, for example, a customer's order for linotype printing, with *copy* and specimens of type and paper wanted; (*b*) the

material, which must be ordered from the storeroom for issue at a given date; (*c*) a time-schedule must be worked out showing each stage of the order and the date at which it should be completed; (*d*) provision must be made that the machines will be free to do the work within the times respectively specified; (*e*) the quantity to be printed must be specified, with margins for spoilage; (*f*) the ink, if special, must be treated by the same routine as the paper; (*g*) mechanism must be set up to insure that the progress of the order at each stage is registered in the control office, and is not allowed to fall behind time; (*h*) the printing and other machines to be used on the order must sometimes be indicated. The methods by which these various points are controlled will now be considered in detail, so as to suggest the general idea on which each is founded.

48. Time Schedules.—The various operations on the order must not only be performed in a certain sequence, but each of them should be completed by a certain time, if delay is to be avoided. Fig. 10 shows a diagrammatic representation of an elementary form of control board, by the aid of which the different steps on orders are coordinated. The control sheet is divided by vertical columns into day spaces. On this sheet are pinned slips of card, each representing an order. The cards bear marks that represent definite steps to be completed by definite dates. Thus, the two upper cards may represent orders passing through a printery. The left-hand edge of each card represents the date at which the order was received, say Jan. 12. The marks numbered 2, 3, 4, 5, and 6 may represent steps. The right-hand edge indicates the date of delivery, namely, Feb. 2. The steps indicated by the numbers may be these: 2, linotype room; 3, into press room; 4, into folding room; 5, into bindery; 6, into packing room; 7, delivery to transportation company.

49. Control of Delay.—As indicated on the board, the first order should enter the linotype room by the 17th, the press room by the 20th, the folding room by the 24th, the bindery by the 27th, and the packing room by the first of

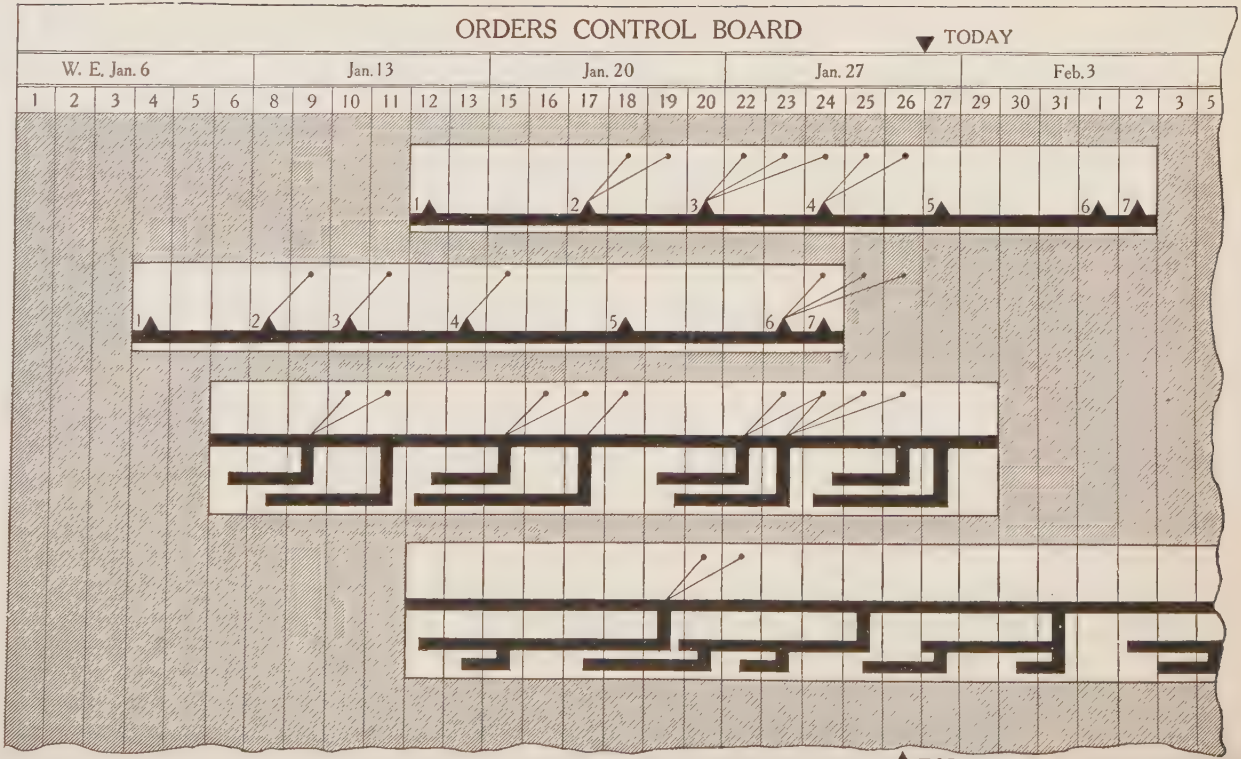
ORDERS CONTROL BOARD
TODAY
W. E. Jan. 6
Jan. 13
Jan. 20
Jan. 27
Feb. 3
1 2 3 4 5 6 8 9 10 11 12 13 15 16 17 18 19 20 22 23 24 25 26 27 29 30 31 1 2 3 5
TODAY

FIG. 10

February. It is assumed that today is January 26. Whenever an order passes from one department to another a report to the control office is made, and in the absence of such a report it is assumed that progress has not been made. Each night, therefore, the delays to date are marked against each order, by drawing lines from the date due to the actual date. Thus, the order due in the linotype room on January 17, was not reported on the 18th, so a line was drawn. On the 19th it was still unreported, so another line was made. On the 20th it was reported, so no further annotation was necessary. Similarly, the record shows a delay of three days in passing from press room, No. 3, to folding room, No. 4. Up to the present the first order is two days overdue in passing from No. 4 to No. 5. In the same way, the second order, which was due to be delivered to the railroad on 24th, is three days behind schedule in the packing room.

50. Reading Control Board.—All the information carried by the control board is taken in by the eye at a glance in much shorter time than it takes to describe it. An order cannot get much behind before the fact is observed, and the board indicates precisely in which department the delay is occurring. A few nearly vertical lines will not signify much, but as soon as any line gets to be long and tends toward the horizontal, the eye singles it out for attention. In practice, the control office will investigate all delays as soon as they appear to threaten non-fulfilment of the delivery promise. Each day something will probably occur calling for investigation, but whether there is a reasonable explanation or not, an order that is much behind cannot fail to attract and retain attention.

51. Informing the Customer.—Another important function of the control board is in making it possible to give reasonably accurate information to the customer, when he inquires as to the probable time of delivery, or wishes an order to be expedited. The exact stage of the order is ascertainable in a moment from the board. Familiarity with the run of business will enable the control office to estimate a date for

delivery, if it is possible to expedite the order. Thus guesswork is avoided, and the fatal defect in a badly organized business—putting the customer off with a wild promise that will most probably not be kept—is rendered unnecessary.

52. More Complex Type of Control Board.—The lower half of Fig. 10 illustrates in a very elementary way the principle of control as applied to industries in which components are assembled in groups and join the main order at different stages. Thus, to take the third card from the top, it will be seen that the order was started on the 6th, and that components were due to start on the 6th, 8th, 12th, 19th, and 24th. These components should be ready to enter the main order on the 9th, 11th, 15th, 17th, 22d, 23d, 26th, and 27th, respectively. As shown by the black pins and inclined lines above the main black line, each of these orders has been subject to some delay. The item due on January 23 is most seriously affected, being three days behind. In the order on the lowest card, a triple series is shown. In this case the articles made, represented by the lowest lines, do not enter the main product, but are themselves absorbed into other subassemblies, which join the main stream later. More complex relations than these can be shown in similar manner when the work demands it. In the case of a large machine, containing many parts, the control would demand a large board apportioned to that order alone. In such cases the control sheets can be hung on swing boards, and the order of the leaves will represent the dates at which each order is deliverable.

53. Difference Between Planning and Control Board System.—In Art. **47,** wherein some of the principal items to be controlled were enumerated, the following, among others, were noted: (*d*) Provision must be made that the machines will be free to do the work within the times respectively specified; (*h*) the printing and other machines to be used on the order must sometimes be indicated.

The method of control shown so far has not taken these requirements into account. It merely records what has happened, and compares actual happenings with what was

expected, but it does not in any way plan the results. Although planning usually includes control, the reverse is not the case. Control boards are independent of planning, and may precede it; that is, the installation of an effective system of control boards may suggest the necessity of planning. The main feature of planning is a careful study of the capacity of machines, followed by the dissection of each order so as to find the demand made by it on the different kinds of machine capacity available. Thus, a printing machine of a certain type may have an output of 25,000 sheets of a certain size in a working day. This is its *load*. If then each order is dissected as it comes in, and its requirements are allotted to definite machines, there will result a series of figures representing the loading of each machine, as far as that day's orders are concerned.

54. Ascertaining Machine Loading.—If a machine will do only one thing, in one way, at one speed, it is a very simple matter to ascertain its hourly load. Thus, a platen press may turn out 30,000 copies per day of 10 hours, and this gives an hourly loading capacity of 3,000 copies. If there is assignable to that press an order calling for 15,000 copies, it is evident that the machine will be loaded to its full capacity for 5 hours. If the morning mail brings twenty orders, which on dissection are assignable to that press, and aggregating 90,000 copies, then that machine will be booked for three days', or 30 hours', work ahead. If, however, there are two such machines, then a loading of 15 hours may be assigned to each, or 20 hours to one and 10 hours to another, according to the urgency of particular orders. This is the general principle of machine loading, but not many cases are as simple as this. The speed of working may vary according to the nature of the work, even in so standard an operation as printing. In dyeing cloth, hardly any two fabrics are worked at the same rate of speed. In machine work, not only does the speed vary with the condition of the metal being worked on, but the time occupied in setting up and holding the piece will vary within wide limits. It will be seen, therefore, that the

ascertaining of load requires thorough technical knowledge of what the machine will do under varying circumstances.

55. Control of Subsidiary Activities.—In many cases, and especially in machine work, order control embraces other things than machine loading and delivery of material. It happens not infrequently that an order cannot be set in motion without certain auxiliaries, and the control office has the task of seeing that these are specified and provided at the proper times. Thus, in foundries nothing can be done until the proper pattern is provided. In machine shops, special jobs require special sizes of drills, taps, reamers, and so forth; and in many cases jigs or holders of special shape are necessary before the job can be placed in position on the machine. All these subsidiary appliances are kept in tool rooms, and the control office has to issue its instructions in such a way that the requisite tools meet the job at the right moment in the right place. Lists of all the tools, jigs, formers, etc. required for the job are prepared and sent to the tool-room foreman, who is then responsible for getting them ready by the time they are required. In some cases certain appliances, in frequent use, but of which the supply is limited, may have to be assigned a definite load, just like a machine, to insure that they will be at hand, and free, when required for a particular job. This is, however, an unusual condition.

56. Control of Material.—In a preceding article it was noted that provision must be made that paper and ink, for example, of the proper quantity and quality, shall be on hand when required. This is secured by cooperation between the order office and the storekeeper. The stores ledgers show the current balances on hand, and provision is commonly made for earmarking or allocating free balances to the use of particular orders. Consequently, the instructions to the storekeeper to have material ready for delivery to the plant at a particular date are very easily met. In most cases it is well to provide a mark on the order control board slip to show this date. If the material is not in stock, but has to be specially procured, this fact should certainly be noted on the

order slip. In such a case it is probable that the dates for the series of operations will be uncertain until the material is either on the way or actually received. Orders waiting for material in this way should be placed on a separate control board until it is possible to fix dates in the usual routine. In complex situations the same principle is applied in much the same way, only the number of transactions is vastly greater, and consequently great care is required to insure that nothing, however small, has been omitted. Otherwise, the whole of an important order may be brought to a standstill.

57. Controlling Machine Loading.—Assuming that the analysis of loading capacity and dissection and allotment of orders are made with reasonable correctness, it is obvious that by setting up an account for each machine, and charging against it all orders at their hour-load rating, and crediting it with all orders already finished, also at the hour-load rating of each, a balance is obtained that represents at any moment the extent to which the time of that machine is going to be taken up in the immediate future. This information is used in fixing the marks on the card slips pinned on the control board, as discussed in earlier articles and illustrated in Fig. 10. If there is on hand an order for a certain press, and that press is loaded up for 30 hours' work ahead, it evidently cannot begin the job for three days from date. It is, therefore, useless to assign an earlier date for the arrival of this order at the press room. By dissecting all orders in this way, settling the sequence in which they are to pass the machines, allotting due dates accordingly, and recording movements by means of the control board, a very satisfactory control over orders can be secured at a comparatively small expense. The same principle is applied to assembled orders, but the application becomes more complex just as the detail to be controlled becomes more intricate. It may be said, however, that the importance of control in such case increases even more rapidly than the complexity.

58. Summary of Control Function.—The principal limits of the function of control have now been explored.

There is, first of all, the fundamental framework, in the systematizing of the relations of the plant personnel. In the second place, orders set in motion the activities of the plant in a previously determined sequence and on a previously determined time schedule. By analyzing the capacity of the machines to turn out work, an hourly load rating can be set up, and by dissecting orders as they come in, the work can be so allotted that a reasonable estimate can be made of the probable time at which any given order will reach its various stages of completion and its delivery. All control, however complex and involved owing to the intricate detail of the work to be performed, rests on the general principles observed in the foregoing articles. It will readily be understood that the executive who compares his current practice in the light of these principles will be able to locate any maladjustment that he finds in his own plant. Control is the function which deals with orders and with those who give them out. Delays, errors, and broken promises of delivery are all due to faulty organization of control. Each of the devices described answers a particular question, and when all these questions are correctly answered, there is little excuse for a high average of either delays, errors, or broken promises. Individual cases will always have their special explanations. It is the average that the executive must regard.

COMPARISON

59. Function of Comparison.—Comparison is described as that function which measures, verifies, and records; or, in other words, it is the watching function. It will at once be realized that, with one exception, presently to be discussed, no other function yet considered has anything to do with either measurement, verification, or record. It has been pointed out in earlier articles that design provided the operative machines, while equipment established them and, by means of orders, set them going, together with the general plant activities. But nothing has, as yet, been said regarding the recording of all these activities, with the single exception

that a method has been described for representing, on the control board, the movement of orders. It may be admitted at once that this step, properly speaking, forms part of the comparison function, but was included, for convenience, under the description of control. In a general way, comparison is the function that takes accomplished facts and examines whether they accord with intentions. It has two main divisions, the one, *inspection,* dealing with physical material, and the other, *accounting,* dealing with quantities and values.

60. Inspection.—When considering the function of design it was stated that design implies tests or standards of performance that should be applied to insure that design has been effectively carried out. In many cases this question of tests has a double aspect. In building any kind of mechanism, the design will first of all indicate certain tests to be applied to each part or component manufactured. Thus, a piece of metal must be finished to exact dimensions measured in thousandths of an inch; or, it may have to pass *limit gauges,* which are a kind of fixed and very accurate calipers, one gauge guarding the high limit of permissible size and the other the low limit. The difference between these two limits is termed the *tolerance* permissible in the article measured. But when all the various parts have thus been made very accurately, and assembled into the complete machine, another series of tests comes into play, namely, tests made to determine whether the machine as a whole works perfectly. Most assembling industries have this twofold series of tests, but in some industries the tests applied as the work goes along are sufficient. The act of applying tests to work in process is called *inspection.* The examination of the working of a completed machine is usually referred to as *testing.*

61. Inspection in Relation to Order Control.—It will be remembered that movements on the order control board are carried out according to reports received from the plant as to completion of each stage of the work. Where inspection is systematized, these reports are made by the inspectors. As each batch of work passes them, they send a report to the

order office giving the order number and the number of pieces that have passed inspection. By this means the order office knows exactly the condition of the order and whether spoilage or imperfect work will make it necessary to put a new supplementary order in hand to make up the full quantity called for by the customer. In some trades, however, as in making screw parts to order, it is usual for the contract to be drawn so that the customer accepts whatever quantity, within reasonable limits, survives the inspection. In printing, a larger number of sheets are put into process than are called for, the excess being the subject of regular tables showing the standard excess for an order of a given size. In cloth finishing, the plant contracts to turn out an exact number of yards from a given length of "gray" cloth, taking the risk of having to pay for shortage, but on the other hand keeping possession of any surplus that may result. Whatever the trade customs may be, it is evidently important that the order office shall know exactly what is happening as the goods pass each inspection station.

62. Diverse Character of Inspecting Operations. It will be seen from the foregoing article, that inspection demands technical knowledge. Although the tests to be applied are often specified in great detail or with great exactness by the department of design, still, in many cases, judgment is necessary. Where inspection is absolute, as in the case of limit gauges, then skill is not required because the skill has been transferred to an apparatus. Unskilled help, sufficiently intelligent, however, to be entrusted with high-class and easily damaged appliances, can be taught to apply a limit gauge to each piece as it comes by, since there is no leeway for error; a piece either will pass or will not pass. But in many industries it is not feasible to apply so simple and definite a test as this. In chemical industries, laboratory tests requiring very special training are often necessary. In such trades as printing or dyeing, the matching of colors and the obtaining of special effects demand special aptitude and familiarity with those classes of work. The planning of suitable tests is a very

important matter. The automobile industry, for example, could not exist in its present extent, were it not for the fact that enforcement of mechanical precision has been reduced, by means of limit gauges, to a series of simple inspections. In proportion as simple, exact, inspection tests can be introduced into a business, its prospects of making money increase.

63. Importance of Inspection.—Inspection compares the results of operation with the intention of design. Consequently, it should be applied as frequently as is economically possible. In its absence it not infrequently happens that product becomes faulty early in its career, but is, notwithstanding, put through process after process until the final discovery that it is disqualified. By this time much expense has been absorbed by it, all of which is a dead loss. Therefore, it is easy to see why, in many industries, frequent inspection is found to pay. In seeking to apply inspection, the executive should examine the course of his work and mark the opportunities for errors and miscarriage. Then inspection should be introduced at important stages, and gradually extended as found advisable. It is much better to begin at some important stage of production than to set up inspection stations indiscriminately, without experience of their necessity. All innovations in this direction should be introduced only in answer to some shortcoming that is definitely felt or known. Then their value is likely to be permanent. But before proceeding to set up inspection stations, the standards that they are to enforce must be accurately established, and if possible reduced to writing, so that there may be no dispute as to the justice of the inspector's decision.

64. Time and Money.—Whereas inspection is essentially a comparison of physical characteristics, as actually produced, with those intended and specified by design, *accounting* deals with an altogether different class of facts, namely, the measurement, verification, and record of quantities and values. In other words, its principal duties have reference to time and money. Of all functions so far dealt with, accounting is nearest to the executive, inasmuch as he depends on it for infor-

mation as to the state of affairs in his business. The main divisions of accounting are cost accounting (including time-keeping) and statistics.

65. Costs.—The subject of cost accounting has an extensive professional literature of its own. Nothing but the briefest outline of its function can be given here. But it will be advantageous to point out certain aspects of the subject that are of special interest and importance to the executive, and that are of a broad scope, so that they hold good independently of the particular system of cost accounting employed or the particular industry to which such system is applied. In recent times, great progress has been made in the methods of cost accounting, but the general underlying principles are often not clearly grasped by the executive, although these principles are in themselves simple enough.

66. Variation in Complexity of Cost Accounting. Just as was seen in the case of order control, and for much the same reasons, cost accounting is developed in very varying degree in different industries. In the case of a simple homogeneous plant, such as a paper mill making only one kind of paper, cost accounting is confined to taking account of all expenditure in the plant and dividing this by the yardage, weight, or other suitable dimension of the product over a selected period, say a month. The opposite case is that of an industry where parts are made in quantity, assembled and sub-assembled, made and purchased, held part-finished in stores, and so on. In such case, a complex condition requires a corresponding development of the cost system. Between these extremes all gradations occur in practice. It will thus be seen that there is no such thing as a universal cost system. Even for different plants in the same industry, local conditions may dictate a very different system. Every cost system needs to be specially fitted to the work it has to do. Although this is so in all cases, yet it is possible to indicate the main lines on which any cost system must operate, as all such systems have the same object in view, though they attain it in quite different ways.

67. Principal Object of Cost Accounting.—On reflecting over the course of work in a factory, with a view to determining just what must be known about costs, it will soon be evident that the viewpoint obtained will be affected by the nature of orders passing through the various processes. Between orders and costs there is an obvious connection, and this relation holds whether the order is an individual customer's order, or whether it is a manufacturing order for say a thousand articles to be delivered into the finished-stock room. The product may pass through, say, five departments, with a different process in each. The cost of departmental work on each order may with advantage be kept separate, so that the accounts will show what the work in each department contributes to the total cost. Again, it will commonly be observed that some departments are less fully occupied than others, some having idle machines and capacity in excess of demand at the moment. This suggests that it might be well to separate the cost of actually doing work from the expense incurred in maintaining idle equipment. In this way, going over the whole field of activity step by step, a good idea may be gained of the sphere of cost accounting in a manufacturing plant.

68. Division of Cost into Production Factors.—If it has been decided that the departmental cost of orders is what is wanted, the next step is to consider the separate items that go to make up the total. From what has already been said about production functions, it will be readily understood that while cost of labor employed in actual operation is a direct cost, and can be measured as and when applied to each order, this is not true as regards the cost of design, or of equipment, or of control, or of the comparison function itself. The expenditure on these functions has no relation to any particular order. In other words, it is what is called *indirect,* or *overhead, expense.* It is also frequently referred to as *burden* or *expense burden.* The collection of all such expense is best made according to a classification customary in cost accounting, the several items being grouped under certain heads known as *production factors.*

69. Enumeration of Production Factors.—The first of the production factors is the *lands-buildings factor,* sometimes called the *space factor.* Under this head are collected all the costs of maintaining the plant in a condition ready for work, that is, heated, lighted, fire-protected, etc. Much of the cost of equipment falls under this head, which includes a rent charge for buildings and premises.

70. Next comes the *power factor,* which sums up the expense of the power department and reduces it to a charge per horsepower hour. Next again is the *stores-transport factor,* which collects the cost of purchasing, storekeeping, and transporting materials. The cost of *supervision* forms a fourth factor. A fifth factor embraces the cost of the *organization,* cost keeping, order control, timekeeping, etc. Finally, there is a *machinery factor,* which represents the cost of maintaining and running the operation machines only and therefore covers the ground of the operation function. The first step in cost accounting is to determine the incidence of each of these factors on the department under discussion, that is to say, the share chargeable against the department for the services represented by each of the factors.

71. Departmental Costs.—There will thus be a series of charges against the department, one for each factor, and also charges for the direct labor and the direct material used on orders. Out of these elements cost is made up. The allowance for direct labor and direct material is very straightforward. They are simply charged to the order on which they were expended. There then remain the production factor charges. How shall they be distributed? The simplest case, and the only one that can be discussed here, is that in which the department consists of a number of machines all alike, say twenty machines. Then the charge for space, for power, for stores-transport, for supervision, and for organization are added together. The individual machinery charges can also be added into this total, as they are all alike. The sum total of these additions is then divided by the working hours of the department, say 20 machines at 240 hours per month, making

4,800 working hours. There is thus obtained an hourly rate for each machine. This hourly rate is then added to the cost of direct labor and direct material, to form departmental cost of operation. Now if for any reason the department does not run full time, all the expense will not be transferred to orders by the hourly rate, since some machines will be idle. The amount of this unabsorbed burden is a very important index to the efficiency of the department. If it is high or tends to increase, it must be explained by lack of work, or else by failure to keep machines employed as they should be. Anyway, it indicates an unsatisfactory condition and is a *prima-facie* case for inquiry.

72. Reason for Separating Idle Time from Used Time.—At the end of a slack month, there will have been so much of the total burden charged to orders by means of the hourly rate for the use of machines, and so much will not be charged anywhere. It is unabsorbed. In a very busy time when the shop is running full of work, every machine will be working at a maximum and little or no expense will fail of distribution to orders. The costs so obtained in the busy time are the *true* working cost of the department. Now if there is a slack period and half the machines are idle, the expense may be no less or little less, but only half the work is done and consequently it is, from one point of view, costing twice as much as before But this increased cost cannot be recovered from the customer. It is therefore of no service for estimating or bidding on new business. By the device of the hourly rate, however, the order costs, officially, that is, on the books, no more in slack than in busy times, other things being equal. But the unabsorbed burden is much greater. This unabsorbed burden, however it is regarded, must be charged to profit and loss account. There is no one who can be made to pay for it. It is therefore better to keep this unabsorbed burden entirely separate from true cost. This is just what is done by establishing for the use of machines an hourly rate independent of the state of trade. The method must be used with caution, but when so used has important advantages.

RELATIONS OF THE EXECUTIVE WITH THE FACTORY

73. Statistics.—Though plant statistics are part of the function of comparison, they will be considered here more particularly from the executive viewpoint. In many cases the executive does not concern himself very closely with the details of plant management. Frequently the main offices of a business are located in a city, while the plant may be from ten to a thousand miles away. In these circumstances the executive must rely on statistical reports to keep himself in touch with what is going on in the plant, or rather to make sure that nothing is going on which requires his personal attention.

74. Viewpoint of the Executive.—There are two main points on which the attention of the executive should be fixed: (*a*) The output, that is, the quantity of work turned out; (*b*) the factory expenditure. The relation between these two amounts represents the factory efficiency, in a broad sense. Where the product is one that can readily be reduced to units, such as yards, tons, cubic feet, etc., per week, the ratio of expenditure to output forms a very satisfactory control figure, even if, as is frequently the case, the product varies in character and has therefore a slightly different unit cost at different times. But it is not always or often that such a simple ratio can be established. A factory may handle several diverse lines of product, in which the ratio of cost to unit weight or length varies considerably. In most cases, therefore, the executive must be prepared to survey the transactions of the plant in greater detail.

75. Reports for the Executive.—A statement of finished output is obviously the first report which the executive will require. No explanation is necessary as to this. Next in order will be a more or less detailed analysis of factory expenditure, which should be drawn up so that the expenditure in each department is shown separately, and also combined into a general total. Fig. 11 shows a typical arrangement of a report of this character. The burden items for each depart-

ment are first shown separately and then as a total. Next direct labor and direct material are added, and totaled to show total departmental cost. Cross-totals of each item show total factory expenditure in each case. Below, the amounts of burden absorbed by orders, and not absorbed, are given, with the ratio or percentage in each case. It is open to the executive to have the detail shown on this report expanded to any degree he deems necessary. The principal items of expense that make up the factors may be detailed. Direct material

FACTORY EXPENDITURE				WEEK ENDING		
Item	Dep't A	Dep't B			Dep't F	All Dep'ts
Space Factor						
Power Factor						
Stores Transport Factor						
Supervision Factor						
Organization Factor						
Machinery Factor						
Total Burden						
Direct Labor						
Direct Material						
Total Cost						
	Utilized and Unabsorbed Burden					
Utilized on Order						
Unabsorbed						
%						

FIG. 11

and direct labor may be shown by classes of product, if there is more than one such class. The report will be accompanied by another showing the output, by classes or otherwise as the case may require. By comparing one month or week with another, and noting increases or decreases in any of the items, the executive will be able to keep fairly close control over the essential economy of the factory, without losing himself in detail. It is assumed that the factory is under a thoroughly competent plant manager, so that only a general survey of the situation is necessary.

THE MAKING OF AN EXECUTIVE

(PART 6)

Serial 1988F Edition 1

MARKETING THE PRODUCT

INTRODUCTORY

1. Range of the Discussion.—In this Section will be considered the series of operations by which business is sought and obtained. These operations cover *publicity* and *advertising,* the first line of approach to the public; *estimating,* which is price making based on previous cost records; and *selling,* which must here be understood in a broad sense as including personal approach to the prospective customer and also the entire organization and mechanism of a sales department.

The viewpoint to be adopted in the present discussion will be mainly that of the executive in his relation to the problem of cultivating and securing new business.

2. Modern Development of Selling Methods.—The routine and practice of business-getting has undergone considerable development in recent years. A great deal of inquiry has been devoted to the examination of the fundamental principles that underlie the processes of announcement and persuasion. The psychological aspect of sales promotion has been studied extensively, and the study of sales possibilities, the planning of sales campaigns, the organization of cooperation or teamwork between the different functions represented in a selling department, have all been developed into a very valuable body of standard practice that greatly assists in the direction of economically sound sales promotion. Such practice, if

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carefully adhered to, will prevent rash and wasteful attempts to create business by lavish expenditure in ways and in quarters where the returns could not possibly be adequate, even under the most favorable circumstances. In recent years, too, much specialization has developed in this field. The designing and writing of advertisements, booklets, and campaign literature generally, is largely in the hands of experts trained to pick out just the salient points for propaganda that will appeal to the public. These experts can do more effective work than the average firm can do for itself. It cannot be said that any crystallization of selling principles is as yet in sight. The subject has been developed empirically and is not yet reduced to a coherent system, but from a practical point of view the surface of the subject has been mapped out into several independent areas, and the practical executive needs to understand these main divisions in order to exert effective control over their activities.

3. Main Divisions of the Subject.—In approaching the systematic study of marketing wares, it will be convenient to consider the subject as divided into three main topics: (*a*) the *product* to be sold; (*b*) the *field* of prospective purchasers; and (*c*) the *propaganda*, which term may be taken to cover a variety of activities included under the head of sales promotion. Much more attention is being given today to the first two of these divisions than formerly. The product is not taken for granted. It is studied from many angles to insure that it is being offered in the most merchantable form. The prospective customers are studied with equal care. It is not sufficient to know that such customers exist; a survey must be made to ascertain their probable number, their geographical diffusion, their total purchasing power, and the extent to which they are being subjected to the influence of rival or competitive sales propaganda. Having determined the elements of the situation as regards product and field, it is then necessary to draft a scheme of organization for a sales promotion department that will exert the right influence in the right quarters and at the right time on the prospective customers.

4. Sales Promotion Activities.—Of the three main topics mentioned in the preceding article, sales promotion is the most complex. A study of this topic must cover a number of items, representing so many different influences brought to bear, each of which must be suitably adapted to the general plan of operations. Thus, sales promotion includes *advertising,* which may be either national in scope, or confined to trade papers, or to local and sectional organs; *mail solicitation,* in which the field is addressed by means of form letters and other communications; the use of *printed matter,* which may consist of catalogs, price lists, bulletins, house organs, or simple advertising leaflets and booklets; *salesmen,* or traveling men, whose function need not be enlarged on; *demonstrations,* either at stores or at branch offices, or in the customer's own office or plant; *distribution of samples,* a method obviously confined to certain varieties of product. A sales promotion campaign is not restricted to the use of any one of these expedients. More commonly it will embrace the use of all or nearly all of them. The importance, therefore, of coordination and cooperation in these very different varieties of sales activity hardly needs demonstration. A sales campaign is, in many ways, much like a military expedition. The general in command must know how and when to use cavalry, artillery, mines, airships, and so forth, and must know how to gauge the psychological moment for maneuver and for attack. So, also, salesmanship depends largely on the exploitation of the psychological moment.

THE PRODUCT AND THE FIELD

5. Idea Behind the Product.—The term *product* embraces an almost infinite variety of things, from battleships to tin cans, and from hand-made articles to goods produced by the ton or the mile and sold in carload or even shipload lots. Very little thought will serve to show that among such different kinds of product there must be enormous differences in the way in which they are sold. In point of fact, almost every individual product requires a sales promotion method specifically suited to it. In deciding on the best method, the first step is

to survey the peculiarities of the product to be sold. A number of questions arise: What is to be marketed, a *thing,* or an *idea?* It should be observed that in selling a piece of heavy machinery, for example, what is sold is really an idea. In the same way a breakfast food may be merely a cheap cereal put up in an expensive, though attractive, way; what is being sold, in such a case, is an idea, the idea of so preparing a food that it will have an appeal to the average man or woman. It is impossible to go very far into the analysis of motivation in buying, without finding that in the majority of cases it is an idea that is being sold rather than a concrete thing. The first thing to do, therefore, is to regard the product from this angle, and ask, What is the salable idea embodied in it?

6. Appearance of the Product.—An attractive appearance of the product is a more powerful aid to selling than might perhaps be expected on casual reflection, and this is true even of some goods in which appearance may seem of altogether secondary importance. The manufacturer will therefore profitably keep before his mind the question, How can the appearance of the goods be improved? In dealing with this question it must always be remembered that it is appearance to the purchaser that counts. Even in machines, some attention should be given to appearance. What parts should be painted or enameled, which should be bright, whether or not a stand is desirable—these are points that should be settled before offering the product. In other cases, the importance of a pleasing exterior is more obvious. Where goods are made into packets, the shape, color, and labeling assume great importance. Often, as in a certain brand of chewing gum, good talking points are extracted from some particular method of wrapping. In such a case, once more, it is an idea that is being sold. In goods sold against specification the mere appearance of the article becomes less important, though even here, between articles exactly alike, preference may be given by the buyer to one that is conveniently packeted, or put up in containers that are easily opened and handled. This, however, is not so much a matter of appearance, as of convenience.

7. Containers and Packing Methods.—The question of containers has another aspect. The extraordinary complexity of freight classifications makes the choice of containers one directly related to expenditure. A study of the matter by a man thoroughly versed in such classifications will often lead to the discovery that by the substitution of one kind of container for another, or by subdividing the shipment (as in the case of machinery and its accessory shafts and pulleys) considerable savings can be effected, by permitting the shipment or part of it to qualify for a lower classification, and therefore to benefit by a lower freight rate. Many points must be considered in selecting the mode of packing and the type of container. Ease of packing and loading, perhaps with the use of automatic machinery; the saving of space in shipment; convenience of handling into and out of the car and into and out of the customer's storage; the residual value of the container, and its possible return to and reuse by the manufacturer—such are some of the things that must be duly weighed in organizing the methods and types of packing employed. There is no royal road to success in this matter, no one solution for all problems that arise; in each case the situation must be surveyed, looking at it from all the angles indicated.

8. Some Reasons for Failure.—It will now be seen how it may come about that an apparently excellent product, in the manufacture of which great care has been expended, nevertheless fails to take hold on the market. It is not enough to have a good product. Very few products have advantages so evident that they make their own way by sheer excellence. It is, more particularly, not enough for the maker to know that he has a good product. He must have a clear view of the definite idea that it represents. Then, the product must be prepared for marketing in such a manner that all the auxiliary advantages that can be devised are added to its original claims for attention. Neglect of these points may not bar success, but will certainly make success come more slowly. Rough or careless finish or packing, though it may

not really diminish the ultimate value to the user, will surely predispose the buyer against the article. In most cases attention to the points just mentioned costs very little more than the time given to the discussion. The actual carrying out of good finish and good packing will probably cost no more than inferior work, once proper arrangements are made.

9. Surveying the Field of Operations.—All possible points having been settled with regard to the product, the next step is to consider the nature of the available field of sale. It is not uncommon for enthusiasm generated by some improved machine or appliance to cause the maker to rush in with intensive work in advertising, calling on prospective buyers, and so forth, only to find that the field in which it is possible to get business is so restricted as not to warrant anything like the expenditure incurred. An instance of this kind may be cited. A certain firm making an apparatus of very restricted application, yet involving a large investment, had a very costly catalog of some hundreds of pages. It was proposed to translate this into Spanish and distribute it among users in Spanish America. It seemed desirable, however, to make sure of the possible field first. This was done. It was found that exactly sixty-three copies would be wanted, with very little chance of usefully planting other copies in the hope of developing business. In view of the great cost of doing the work it was decided to abandon it and to use the money to send out a man who could personally cultivate relations with the very limited field found to exist.

10. Cost Made and Cost Sold.—The example noted in the preceding article is by no means an isolated case, though it is not often that activity is so grotesquely out of proportion to possibilities. The possession of a good product does not mean the possession of a good profit. Mechanically or technically a thing may be excellent, but its commercial value may be very little. It may be useful as a side line and no more. Many little specialty plants are founded, only to disappear in a short time, just because the expense of selling the article takes all the profits. The cost of a thing *made* is a very dif-

ferent matter from the cost of the same thing *sold*. The world is full of wonderful devices and appliances that lack supporters. Why? Because, though it is easy to set up a plant and make these things, it would require much capital to keep the field until the ideas embodied in the devices were sold to the ultimate consumer. It is not surprising, therefore, that the modern sales promoter begins by ascertaining what relation his product has to the possible users or consumers. It is not merely the number of possible users that counts—a device may have every factory or every office for a possible customer; much depends also on what degree of inertia must be overcome in persuading the public to use the article. A very expensive, complex device, although labor-saving and perhaps doing something that could not otherwise be done readily or at all, may be adopted ultimately by every office or plant in the country, but it may take many weary and discouraging years of pioneer work to get to that stage.

11. Ultimate Consumer.—The relations of the manufacturing firm to the ultimate consumer are very important elements in sales promotion. In former times no self-respecting manufacturer did other than wholesale business. The private consumer was entirely beyond his field of vision. The same cannot be said today. The tendency is for the manufacturer and the ultimate consumer to come into closer contact, although, in many cases, from the nature of the product, there are several handlings by third parties. On the other hand, where the product represents much capital outlay, direct relations between the ultimate consumer and the manufacturer are the rule. The same may hold, though the amounts involved be small, if the selling of a new idea is the essence of the business done. Typewriters, adding and calculating machinery, and most office appliances are in this class. Cost of selling in such cases is enormous, and without direct contact the business would never pay. In regard to any product, therefore, the first question is whether it is necessary or desirable to go direct to the ultimate consumer. The alternative is selling to wholesalers or jobbers, or direct to storekeepers.

12. Difference Between Handling and Persuasion. It does not follow, because a product is handled by wholesalers or retail storekeepers, that the firm is content to leave to such agencies all the work of persuading the public to purchase just such and such product and no other. In the case of an ordinary product, where no special education in the use of it is necessary, the question of handling it through the trade is a matter of convenience from the mechanical viewpoint, rather than from the sales-promotion viewpoint. The manufacturer's part in the selling operations, in such a case, resolves itself mainly into a matter of moving goods. In a general way, goods will not move, or continue to move, unless the attention of the public is persistently called to them. It is not, however, the function of the wholesaler or even of the retailer to push other folks' business, unless paid to do so. As it is in any case a matter of expenditure, the choice lies between giving large commissions in the hope that sales will be boosted by the trade, or of spending the same sums directly in advertising and gaining the ear of the consumer himself. The latter way is perhaps the surer, since the results are more closely under the control of the firm spending the money. In other cases, where the consumer must be educated in the use of the product, the mechanical services of the trader are of very little value, and the product must be sold direct by the specially trained representatives of the company. Cash registers will suggest themselves as an instance in point.

13. Approach to the Ultimate Consumer.—The principal ways in which the ultimate consumer is reached are indicated in diagrammatic form in Fig. 1. The first method is the simplest, and has been developed to enormous proportions by some firms, known as mail-order houses. Such houses, however, are merchants rather than manufacturers, even though, as is the case frequently, they control numerous factories whose entire output they take for distribution. There are many disadvantages in doing business in this way. Where the articles sold are standard and invariable in grade, it is perfectly satisfactory; but when quality, pattern, texture, and

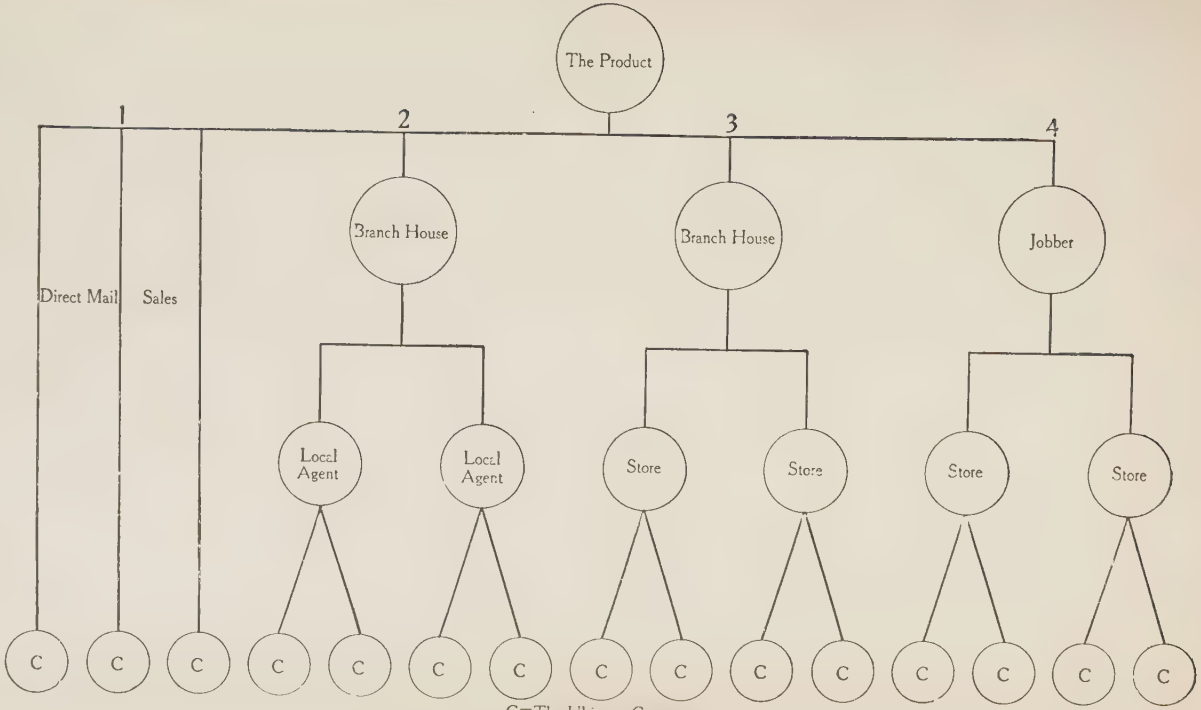
The Product
1
2
3
4
Direct Mail
Sales
Branch House
Branch House
Jobber
Local Agent
Local Agent
Store
Store
Store
Store
C
C=The Ultimate Consumer

FIG. 1

so forth are involved in the choice, satisfaction is not so easily attained. The trade of such houses was originally built up in remote country districts, where people were almost forced to buy through the mail if they wanted to buy at all. But by degrees a kind of mail-order house standard has been evolved, so that purchasers, from a perusal of the catalog, have a pretty close idea of the quality they are going to get. The preparation of catalogs is an all-important part of this method of trading. Outside this special class of enterprise, mail-order business is confined mainly to the supply of specialties carrying large profits. The theory of mail-order business is the acquisition of a customer that will stay with the firm for years, sending in more or less regular orders for small amounts, with no further expense to the firm than an annual catalog. Unless this condition exists, mail-order trade must yield large gross profits, or the expense of getting business will be too great.

14. Branch Houses.—Eliminating mail-order business from the discussion, and with it all communication between the ultimate consumer and the headquarters or plant, there remains the problem of reaching a great number of ultimate consumers, scattered, perhaps, not only all over the United States, but throughout the civilized world. In the majority of cases such consumers make their purchases at stores, but in certain classes of business the service afforded by the ordinary store is insufficient to push the goods. In this case local agents are appointed who are either employes of the firm or who may be selected storekeepers willing and able to give time and attention to the sale of the specialty. In either case these intermediaries between the ultimate consumer and the firm are likely to be very numerous and widely scattered. Hence, as a connecting link, branch offices are commonly set up in convenient localities, such branch offices doing all the local business with agents or storekeepers and forwarding the orders to the head office. In Fig. 1 the relations of the branch house to agents and storekeepers, respectively, will be seen under the numbers 2 and 3. In general, goods are shipped in bulk to the

branch offices and thence distributed to the local agents or storekeepers.

15. Jobber.—The fourth, and still the most usual method of distribution, is that shown under the number 4 in Fig. 1. Here the place of the branch house is taken by the jobber, that is to say, by a middleman who makes it his business to buy goods wholesale and sell them to the retail trade. The whole country is, in this case, covered by territories allotted to jobbers, just as, in the case discussed in the preceding article, it was covered by territories divided among branch offices. A system of distribution is necessary in any case, and the choice lies between making use of that already in existence by way of the jobber or setting up a new one under the charge of branch offices. Obviously, it is one step nearer to the ultimate consumer to eliminate the jobber. On the other hand, if the jobber's services are dispensed with, the manufacturer must assume all the labor and expense of grinding out new channels of trade, which the jobber has ready-made. Against this disadvantage must be weighed the consideration that one act of persuasion is eliminated with the jobber. For, if he is to be employed, *he* must first be persuaded, and then persuasion must again be further carried to the retailer or storekeeper. Reliance on a jobber also involves a risk. He may not be loyal. A firm that relies on the jobber may find its market seriously and suddenly curtailed because he has switched over to a competitor, carrying with him most or all of the retailers with whom he does business.

16. Lack of Standardization.—At the present day the methods of distribution are in a condition of flux, or confusion. Some firms adhere stiffly to the older method of doing all business through jobbers; others just as rigidly eliminate the jobber altogether; still others will sell to anybody whatsoever, grading price in proportion to size of shipment; some do business through jobbers in some parts of the country and cover the ground with branch offices in other parts; and so on. The fact is that the development of methods of distribution lags greatly behind that of methods of production. The cost of

distribution is often almost scandalous. It is probable that the near future will see great developments in this field, and if a guess may be made, progress will probably be in the direction of divorcing the handling of goods from the selling. The former is a mechanical problem, and could be met by a reasonable amount of cooperation. The latter must always remain an individual task, and it must be left to the firm making the goods to decide whether it will pay or not to attempt an extension of the amount of business in any particular field. Meanwhile, it will be seen that a considerable range of choice exists as to the method of marketing a product, and much of the success of a business will depend on making the choice best adapted to each particular case.

METHODS OF INFLUENCING THE CONSUMER

INTRODUCTORY

17. Propaganda.—Assuming the existence of a product in marketable shape, and a field already decided on, in which the product is to be sold, the next step is to consider methods of propaganda, that is, of bringing influence to bear on the minds of individuals so that they will presently be moved to purchase the product in preference to other products of similar character. What has already been said about the marketableness of product should be borne in mind, because, although the persuasive powers of the sales-promotion division may be very great, these powers will be more or less wasted if the product fails to come up to the highest standard of quality, convenience, appearance, and so forth. The better the product, the more it deserves good salesmanship; conversely, a good sales organization is so high-class and valuable a piece of machinery that it should never be employed on a task beneath its merits. All that can result from such practice will be a damaged reputation, which will affect the utility of the organization for other objects. The better the sales organization that he has developed, the greater should be the care of the executive to see

that any product offered to the public by its aid should be in all respects first-class.

18. Direct Mail Appeal.—The use of the mail for direct action on the ultimate consumer, the retailer, or any other class of buyer, is becoming more common every day. The campaign is addressed to the persons appearing on a carefully selected list of names, and the form letters and printed matter sent out are designed to produce, each of them, some one definite effect. Thus, the campaign may take the shape of a series of communications, each dealing with some one talking point of the product. Two ends are aimed at here. One is the cumulative effect of a well-worded series, assuming that all or most of the letters are read by the recipient. But even more important is the other effect aimed at: Each letter should strike a different keynote, that is, it should approach the subject from a different angle. If there is a series of, say, seven letters, there are seven different chances of striking the attention of the reader from some angle that will appeal to him. The importance of varying the argument is thus manifest. It will pay the executive to give considerable attention to the preparation of the circular letters in such a campaign. Often it will be desirable to employ the services of one of the firms that specialize in such work. The art of stating the case concisely, forcefully, yet without appearance of exaggeration, is not possessed by every one.

19. Follow-Up.—Closely related to the direct attack by means of mail matter is the problem of following up inquiries. This branch of propaganda is mostly associated with national or trade advertising, which is depended on to bring the inquiry in the first place. When the reply to the inquiry does not bring an order, it is usual to subject the inquirer to a carefully directed bombardment through the mail, at predetermined intervals. Only experience can show how far this should be kept up. A rapid-fire campaign, if not judiciously planned, may overdo matters. In any case it is well to keep a close record of the success of each piece sent out. Ineffective pieces may thus be eliminated and their cost saved. If no business

results from an inquiry, even after a series of follow-up letters, the case should be put on one side, but occasional letters should still be sent at somewhat wide intervals, since inquiries of this character have a way of unexpectedly maturing after long periods, when they might be supposed to be dead. Follow-up matter may consist either of form letters or of printed matter, or of both together. It is probable that the best effect is made by using letters sparingly, and mainly to enforce the effect of a series of mail pieces of printed matter. There is then some natural excuse for writing the recipient, considering the attention that has already been paid him.

ADVERTISING

20. Field for the Expert.—The subject of advertising in national, local, and trade or sectional mediums is one on which many volumes have been written. While mail propaganda is a matter of which the expense, though considerable, is at all times under full control, the same cannot be said of advertising. The authorization of advertising expense should therefore be very closely considered by the executive, since advertising is mostly contracted for over long periods, unless high prices are paid for short-term or single insertions. The sum to be spent in advertising should be budgeted, or determined rigidly in advance. For the most part, advertising produces only a favorable seed bed; that is, it prepares the mind of the reader to consider a definite proposition when, and only when, the latter is made. In other words, advertising, except in special cases, does not bring orders, but only inquiries. These inquiries must be turned into orders by one of the other methods described in this Section. The preparation of advertising copy demands as much attention as that of the contents of mail pieces or form letters. Inasmuch as the connected expenditure is large, and sometimes very large, what has been said as to the engagement of experts to write circular letters applies with still greater force to the preparing of advertisement text and illustration. Too many executives ignore this. It should be remembered that the contracting for space is only

the beginning of advertising. Even though exactly the right mediums are selected, the nature of the appeal that suits each medium has still to be considered. Expert assistance is very important in this field.

21. Varieties of Advertising Aim.—Before spending even a dollar in advertising, the executive should get a clear view of what he proposes to attain by its aid; for advertising has many uses. In the foregoing, that kind of advertising has been considered which is devoted to provoking inquiries. But all advertising has not this aim. Frequently its chief aim is to make the name of the advertiser a household word. A historical case may be cited. The vast business of the English steel-pen maker Gillott was built up early in the nineteenth century by innumerable small advertisements in the form of a visiting card, which were carried for many years in almost every available medium, not only in the United Kingdom but in most civilized countries. The card displayed nothing but Gillott's name and the fact that he made steel pens. It is more than probable that not a single pen was ever sold by this advertisement. But the name of Gillott became identified with steel pens. On the other extreme, many manufacturers carry full-page or double-page advertisements in a few mediums of nation-wide circulation. The idea is the same. It is the persistent placing of the name before millions of persons that prepares a seed bed from which orders are raised by other methods of cultivation. In this class of advertising not even inquiries are expected, and certainly no direct sales. Of late, however, a further development of this kind of advertising has taken place.

22. Advertising by Samples.—Large-scale national advertising has been developed by some firms in a way that has a two-fold advantage. The idea is to offer, free of charge, either an explanatory booklet concerning the firm's products, or, where suitable, a sample of the product. One advantage secured by this method is that it furnishes a check on the way in which the advertisement is influencing the consumer; another is that the names of a large number of prospects are

secured, who may be worked on later by local influences. A paper manufacturer, for example, sends portfolios of paper samples, with literature showing how each class of paper may be put to advantageous use by the private user. These firms do not sell a sheet of paper direct to the consumer. But they get their advantage by acting directly on his mind; in other words, they are selling him an idea. The handling of the paper is an altogether separate matter, which goes through a routine of jobbers and agents. In the same class is the advertising addressed to architects and professional men in their professional journals. Such men buy nothing, but they can specify the use of the product by others. The use of the sample is common in this case also, where the nature of the product permits.

23. Dangers of Advertising Expenditure.—The indirectness of aim which is inherent in most advertising naturally makes it a delicate and ticklish matter to handle. Probably, a very large amount of the money spent on advertising is wasted, even with all the advanced methods of design and control now in use. Where money is plentiful and the sledge-hammer type of propaganda is adopted, practically all available mediums are occupied, and the misses are absorbed by the hits. But where only a limited appropriation can be had for advertising, it becomes highly important to distribute the expenditure in the most advantageous manner. Every dollar must make its mark, if possible. The fact that no one can ever really tell the ultimate extent of the influence of an advertisement makes the choice difficult. Where machinery, for example, is being advertised, a whole year may pass without an inquiry, and yet ultimately an order will develop out of the advertisement, the value of which may pay for the whole year, with plenty of margin to spare. But in cases where profits are small, that is, where transactions must be many, there the number of results directly traceable to a given medium becomes a fair test of its advertising value. In general, especially with a young firm, only such advertising should be continued as is known to pay its way.

24. Poster Advertising.—An altogether distinct class of announcement is poster and bill-board advertising, such as commonly exhibited in street and railroad cars. While much of this is simple national advertising of the kind intended to familiarize the name of the advertiser, some of it has an additional purpose. It serves to connect the general idea of the product with the name of the local agent or storekeeper from whom the goods can be obtained. Automobiles, sewing machines, typewriters, and so forth are commonly advertised in this way. Less usually the poster will bear the names of several agents or storekeepers who thus share the benefit. Much of this class of advertising is strictly local, and its results can therefore be fairly well measured. Intensive campaigns in particular cities and country districts are reinforced by such advertising. The case of the posters that line the sides of railroads, mile after mile, is a different one. Except in the case of hotel advertising, such posters are in the nature of familiarization devices. No direct business is expected from them, nor could it be very well traced to its source if it came. Hotel posters, on the contrary, are expected to bring business directly, though, of course, it is very difficult to determine how much they do bring. A young firm of limited resources can use posters effectively only in connection with intensive campaigns, town by town, as only thus do they pay their way, and are they measurable for results.

25. Catalogs.—The term *printed matter* is a very elastic one, comprising as it does the expensively illustrated and bound catalog, and at the other extreme, a simple leaflet or card intended to emphasize some minor detail. Beginning with the more expensive forms, it may be said that the modern tendency is away from the large bound catalog and toward a loose-leaf form. There are many advantages in this. In lines where changes in detail are liable to occur (and this includes all mechanical appliances) the loose-leaf form can be kept up to date without the necessity of reprinting the whole book. A single section or even a single leaf can be printed and sent out, or supplementary leaves can be added. The disadvantages

are that the customer will frequently neglect to replace the obsolete matter by that sent him. For this reason some firms prefer to get out their catalogs in thin sections of perhaps twelve or sixteen pages, more or less, and issue them in a numbered series, with a notice that all previous issues of that section are cancelled. Another disadvantage is that loose-leaf publications lack the imposing form of the bound book. If much consulted, they are apt to become untidy by tearing of the pages at the fastenings. Nevertheless, it is probable that the loose-leaf or sectional system is destined to gradually replace the bound book. New firms will do well to adopt the loose-leaf form, giving considerable care to the details of the covers and method of securing the papers therein and to facilities for addition and replacement of pages.

26. Mail Pieces.—The term *mail piece* is used to denote a class of publicity matter of a character somewhat different from that of catalogs and price lists. The latter are, usually, simple statements of sizes, prices, and qualities. Mail pieces, such as booklets, folders, cards, and leaflets, are, on the contrary, mainly argumentative. Each seeks to emphasize some particular point; it is a means of exercising influence on the judgment of the consumer. The preparation of this class of printed matter is a work of considerable importance. While the catalog represents sober fact, the folder represents fact interpreted by a little imagination. This does not mean that anything but strict truth is to be told; but the truth must be told in a lively and catchy way so as to arrest attention and provoke interest. The folder or other mail piece bears the same relation to simple catalog matter that headlines in a newspaper bear to the news told under them. Each such piece should ring on a keynote, and the more definitely it harps on this keynote, the better. The object is to hammer home a single impression, and this must not be weakened by attempting to cover more than a very limited aspect of the whole set of facts. Such literature should be short, concise, well produced in point of type and color, and may be illustrated, if the subject matter permits. Pictures always speaks for them-

selves, but they must be part of the story. Expert assistance in designing such printed matter will usually repay the expense.

THE SALESMAN

27. Procuring Orders.—In the majority of cases (except in the mail order business) it is the work of the salesman to procure orders. The term *salesman* is very elastic, including in its scope, at one extreme, the technical expert, highly educated and highly paid, who handles business involving large capital sums, and, at the other extreme, the house-to-house canvasser. The average salesman is a man with a reasonable knowledge of the goods he sells, sufficient at least to bring forward a variety of arguments in their favor, and gifted with sufficient personality to meet and deal with a great variety of buyers. In recent years much study has been given to the problems of salesmanship.

28. Training of Salesmen.—There can be no doubt that some men are naturally gifted with a talent for salesmanship. But, as in all such cases of a special gift, those possessing it are comparatively few. Also, like many other clever and talented men, these naturally gifted salesmen are apt to be difficult to handle, and are with difficulty brought into line with rigid system. On the other hand, the very scarcity of such men makes it necessary, in the case of any large organization, to build on the basis of the ordinary or average salesman. In such an organization the exceptional man will hardly find a place. The one final test of capacity is the actual record of goods sold; and in a large organization a high average throughout is preferable to brilliant results in one place and poor results in another. All the methods employed to sift candidates tend to bring forward just the type of man who can be built into an organization, that is, the man of average gifts. Such men must, then, be trained on a uniform pattern, and furnished with standard stock arguments. When it is seen that they have a reasonable understanding of the merits of the goods, they are sent out, and careful watch is kept on

their efforts. While special care has thus been taken in developing the average salesman, this must not be taken to imply that there is no place, today, for the specially gifted, the born salesman. He still maintains his superiority when working under conditions suitable for the free display of his gifts. But his field is different from that of the unit in a large sales organization; each type of salesman has its own place.

29. Place of the Natural Salesman.—The smaller the organization, the greater the necessity for finding and keeping the gifted natural salesman, because the small firm has neither the requisite facilities for training the average man, nor can it rest content with a small uniform average of success. The place of the natural salesman is, therefore, with the specialty firm, where unusual situations are constantly being met, and stock arguments and standardized approaches are apt to fail at the critical moment. Where business is being done with hundreds of regular buyers, themselves immersed in a routine, it is conceivable that training can be arranged to meet all situations likely to occur. But not all business is of this character. A *man*, rather than a *method*, is required to handle some negotiations, and when this is the case the natural salesman will have great advantages over the machine-made article. In deciding on his salesman policy, therefore, the executive should consider exactly what kind of business he is about to do, and whether the average man, properly trained, can serve for his needs, or whether it is necessary to look farther afield. Of course, even the natural salesman needs to be in intimate touch with the points of the product, but it will usually happen that the information he selects for himself is sufficient for his needs.

30. Demonstrations.—When the article to be sold has solid superiority, no kind of influence that can be brought to bear on the consumer exceeds that of the demonstration. To actually see and handle the article, or observe it in action, naturally exerts on the prospective customer a favorable influence that can be obtained in no other way. In nearly all business, therefore, the aim is to get the prospect into personal

contact with the thing that is to be sold. The sending of samples, the offer of trial orders on special terms, the holding of demonstrations in stores, and the occupation of space in trade exhibitions are all means to this end. In the case of machines it is usual to try to get the prospect to allow a trial in his own premises and on his own work. Nearly all office machinery is sold in this way, and in special cases, factory machinery also. Many publishers of technical books send them for inspection before purchase, and the same plan is adopted

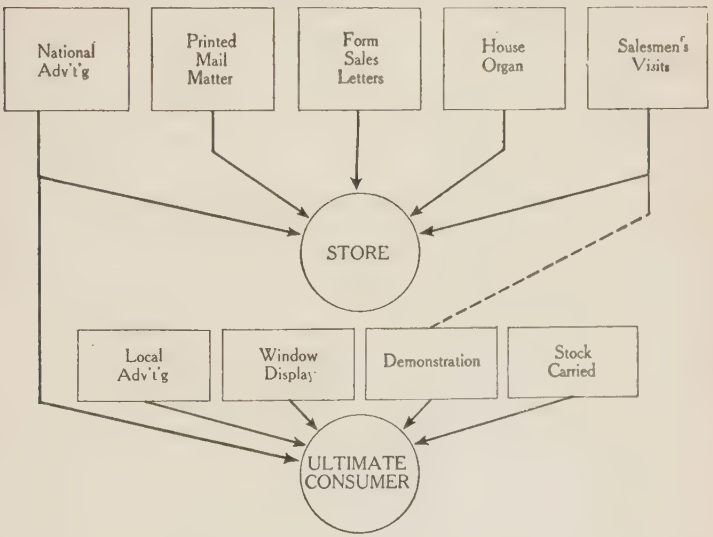

FIG. 2

by publishers of sets of standard authors, encyclopedias, etc. The universality of this practice shows that it is usually a paying one, notwithstanding the risk and expense incurred. It is the average, or net result, that counts. Consequently, where the free trial or a similar plan is adopted, very special care must be taken to record the results of each transaction, and to keep close watch on the costs and profits. This is particularly the case where long credit is given on the instalment plan.

31. Review of Methods of Influence.—Two favorite types of selling method are shown in diagrammatic form in

Figs. 2 and 3. The former represents the case where business is done through storekeepers, while the latter represents business done through local agents, where service is an important point in the selling argument. Office machinery, sewing machines, and all light mechanisms are usually in this latter class. In each diagram, what should be particularly noticed is the influence brought to bear on the ultimate consumer, and the avenues by which he is approached. It will be observed that in the second case, that represented by Fig. 3, this influence

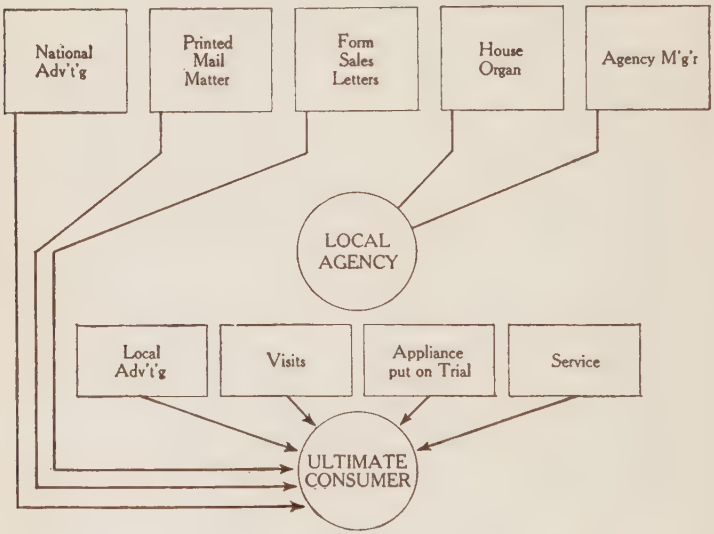

Fig. 3

is much more intimate and direct, and for this reason the plan is preferred when the article is such that an appeal must be made to the intelligence of the consumer. From Fig. 2 it will be seen that the influences at the disposal of headquarters are five, namely, national advertising, printed mail matter, form letters, house organs, and salesmen's visits. But, in the case represented, none of these, except national advertising, is brought to bear directly on the ultimate consumer. All the energy is expended on the storekeeper, to whom it is left to pass on the influence to his customers by the means indicated, namely, local advertising, window display, occasional demonstrations

(assisted by the firm), and the mere fact that he carries a stock of the article. This state of affairs may now be compared with that shown in Fig. 3.

32. Direct and Indirect Influence.—In Fig. 3, the influences at the disposal of headquarters are much as before, except that an agency manager or traveling inspector replaces the salesman. His function is much the same, namely, to keep the local agents personally in touch with what is going on, but he has nothing to do with the taking of orders. In place of the retail stores there is the local office or agency, working to influence the consumer locally, but by different methods from that of the storekeeper. The local advertising situation is about the same as in the previous example, except that this time the advertising is confined to the individual product of the firm. Next, the agent will make calls in his capacity of salesman, and endeavor to find opportunities to place his appliance on trial, or, in other words, demonstrate its capabilities. Finally, there is the strong point of *service,* which, in the class of business now being considered, means maintaining the appliance in order, suggesting new uses for it, and working out methods of applying it to the consumer's work. It will be seen that there is here very strong local influence let loose on the consumer. But this is not all. Headquarters influence is also much stronger and more direct, because printed matter, and even form letters, may be directed to the consumer with a view to enlisting his interest. This attack is guided by the local agent, who furnishes headquarters with a list of prospects so that the fire is directed intelligently and only in directions where local knowledge judges that a useful result will be forthcoming.

CONSIDERING A PROJECT

33. Introductory.—In discussing the steps to be taken by the executive in developing a project, or organizing a campaign for marketing a particular product, it will hardly be necessary to consider the case in which a very large capital is to be expended at the outset in creating a demand. Projects

on a very large scale can be safely handled only by the aid of experts who specialize in the various departments of sales promotion. Attention here will be confined to projects of a moderate magnitude, in which the executive will have to rely in considerable measure on his own resources. As every campaign must vary in details according to the particular kind of product that is being offered, it is obvious that this discussion can be only of a general nature, indicating the kind of steps to be taken, rather than a definite program applicable to any class of campaign. Thus, the introduction of a new breakfast food, or similar article of general use, would probably be undertaken on a very large national scale, and to discuss such a project usefully would demand a volume of considerable dimensions for that alone. A campaign to market some specialty is, however, another matter, and some useful hints can be given that will assist the executive in planning his procedure and establishing an organization on a moderate scale.

34. Points to Be Considered.—Generally speaking, the first thing to be considered in planning a sales campaign is the probable extent of the field. An exception, perhaps, may be made in the case of an article already familiar to the public, such as a typewriter or a calculating machine. In such a case a special study of the field may not be necessary, although even here it will often bring out important facts, such as the extent of demand for replacement of worn-out and obsolete machines, the ultimate limit of what the country can absorb, etc. But in the case of a new appliance, or an article that strikes a new keynote and is not already familiar to the prospective user, it is necessary to consider very carefully not only how many prospects may exist, but also where they are located. For instance, in introducing a new machine for the textile industry, which is mainly concentrated in a few localities, a procedure would be adopted that would necessarily be quite different from that applied to the case of a machine used in iron foundry practice, since foundries are scattered widely over the country. It must therefore be determined at

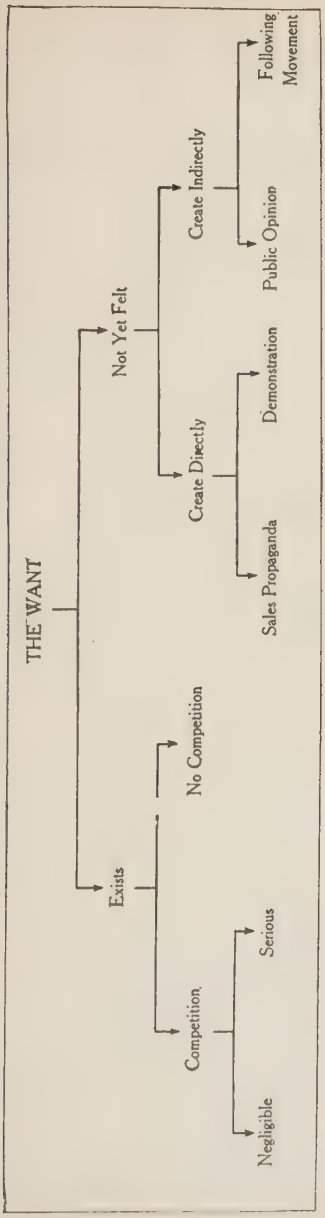

Fig. 4

the outset whether, with due consideration of the geographical conditions of demand, there is really sufficient field in sight. The best way to approach the question of the field is to begin by considering the product in the light of an article destined to fill a want. For, unless it either fills an existing want, or is of such a nature that a want can be commercially developed, it cannot be worth spending money in the attempt to establish trade.

35. Demand Situation. The analysis of the various possibilities which can arise regarding a demand, or, rather, a want, for an article of commerce, is shown in diagrammatic form in Fig. 4. Either the want already exists or else it has to be created. If it exists, either competition has to be met or the situation is such that no adequate way of satisfying the want had previously been found, although the want was fully recognized. If competition is already in the field, its status must be carefully determined—whether it is of no great importance or whether vigorous action to combat it is necessary. On the other hand, the product may be such

that the want is not yet felt, but is developable. Many such cases suggest themselves. Typewriters, calculating machines, special paints, packet foods, patent shingles, and so forth have had to develop their own demand before the product could profitably be manufactured on any large scale. In such a case the method of creating the want requires consideration. The want may be created directly by the usual methods of propaganda or demonstration, or it may be fostered indirectly. Indirect creation of a want for a particular product is a somewhat subtle matter, but, for all that, it is not at all uncommon. Such indirect creation can be effected either by local agitation or by following and promoting existing movements of public opinion. Agitations for safety first, fire prevention, good roads, and so forth, may be skilfully used, by producers of suitable articles, to assist in developing a demand. Public opinion is also sometimes positively manipulated in favor of certain steps that will directly benefit particular interests. Armament makers, and producers of soft drinks and candies, have been credited with such manipulation on a large scale. Whether such allegations are true or false, the general fact remains that public opinion can be swayed to the advantage of the market.

36. The Field.—When it has been determined that a field of sufficient importance exists or is developable, the next step is to analyze this field, in order that a plan of action may be formulated and embodied in a sales-promotion organization. Fig. 5 shows, diagrammatically, the chief elements of such an analysis. The number of probable buyers and their location or distribution is first determined, and should be marked on a large-scale map. Then their character should be discussed, whether they are in the class of ultimate consumers or whether it is necessary to approach them through trade channels. If the approach is to be indirect, then the question must be considered as to whether business is to be direct with retail storekeepers or through the usual channel of the jobbing trade. If the prospective customers are ultimate consumers, say factories or offices, then it becomes a question whether mail business

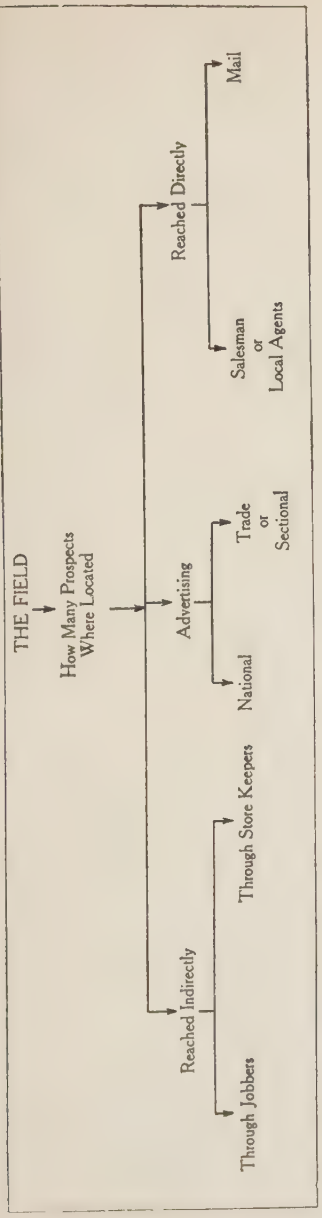

FIG. 5

should be relied on, or whether an organization of local agents should be built up, perhaps with branch offices in different parts of the country. In some cases a simple organization of salesmen will be all that is necessary. This is particularly the case where the article is a costly one, involving capital outlay, as machinery. Many parts of the country may be wholly unrepresented in such a field, for the reason that there are no users of that product in them. It will be seen that the pattern of the proposed organization depends on the result of this analysis.

37. Claims Made for Product.—Having settled the questions of the probable demand and the existence and extent of the field, the next step is to make an exhaustive survey of the claims that are to be made for the product. What is the idea that is to be sold? For behind nearly every new product there is some kind of idea that furnishes the reason for making that product. No wise person will set about producing a thing that he does not believe in. There will usually be some salient feature of the new product, *as the maker sees it.* What

is this feature? It is probably on this feature that the main claim of merit should be based. Such a claim may rest on one of several points. The thing offered on the market may be a new material, such as an artificial leather of a superior kind. The claim may lie in the arrangement of parts, that is, in superiority of design and adaption to use. This is frequently the case with machinery. The new article may be a device that does something no other device will do. A perfectly coordinated cinematograph and megaphone-phonograph would be such a device. Until recently all-around calculating machines and silent typewriters were in this class. The claim may be based, not on the product itself at all, but on the way in which it is presented to the user, that is, on some superior form of service. An automobile, for example, is a common article of trade; but if some one should supply automobiles with the condition of complete maintenance at a very low fixed price, that would be a sale on the merit not of the article but of the accompanying service. The claim that an appliance furthers a public demand—for instance, a road-surfacing compound offered at the time of a campaign for good roads—is an example of a claim made on the basis of public policy.

38. Distinguishing the Product.—When the article to be marketed is already familiar to the public, it is well, before beginning to spend money on propaganda, to seek some means of identifying the particular product as made by the firm. This is usually done by means of a *brand* or *trade-mark*. Many large businesses have been built up on the trade-mark. Common objects of trade, like pepper, salt, spices of various kinds, mustard, and so forth have been converted into revenue producers by being specially packed in parcels or containers bearing a brand or trade-mark, and by then being extensively brought to the notice of the ultimate consumer through nation-wide propaganda. With articles not of this class, that is to say, where the article does not have to be distinguished by the buyer from a host of similar ones, the brand is of less value. Machinery firms, for instance, do not

need the brand. On the other hand, makers of small tools and hand tools often make use of it. "Red Devil" glass cutters, for example, are known to thousands who are ignorant of the maker's name. The words *Kodak* and *Socony* tell their own tale. The brand or trade-mark is chiefly adapted to such articles as are issued through ordinary trade channels and sold to the ultimate consumer by retailers.

39. Margin Available for Sales Promotion.—One of the most important matters to be settled before launching out on a sales-promotion campaign, is the margin of profit produced by the sale of the article. It is at this point that many otherwise excellent schemes go wrong. It is also the point on which expert advice is most valuable. A firm about to engage in a campaign for introducing a new product is naturally enthusiastic as to the speed at which results will follow. They allot a certain sum for promotion purposes, but too often this sum is either selected arbitrarily or is bounded by what the firm can afford to spend. Without previous experience it is very hard for any one to guess the relation of results to expenditure, even when this is carefully budgeted in advance, after exact analysis of the situation. Where resources are not ample in proportion to the strain on them, it will be necessary in most cases for the campaign to pay its way, or nearly so. This can be done only where the margin of profit is such that a certain percentage of it, put aside for propaganda purposes as each sale is made, will finance the remainder of the campaign. Thus, suppose an article is selling at $5, its total cost of production being $3, and suppose it is expected to sell 10,000 pieces in a year by means of an advertising and promotion campaign. The maximum gross return on this turnover will be $50,000, yielding a gross profit of $20,000. If, therefore, a gross profit of 25 per cent. on the turnover is to be retained, not more than $7,500 above ordinary expenditure must be spent on promotion, in that year. Under ordinary conditions, sales promotion should be financed from a revolving fund, replaced little by little as each sale is made.

ORGANIZATION OF A SALES DEPARTMENT

40. Divisions of Sales Department.—The diagram, Fig. 6, shows a convenient type of organization for a sales department. While the internal development and arrangement of the several divisions will vary, especially as regards the number of persons employed, according to the particular business handled, the main divisions and their essential functions will be much the same in all cases. At the head of the department is a vice-president in charge of sales. Then, reporting directly to him, are the following division chiefs: statistician, who is also the assistant to the vice-president, or his private secretary; publicity editor; business manager; field superintendent, or manager of salesmen; correspondent; export manager (only where foreign business is done or sought); estimator, who is the link between the sales department and the factory. Cooperation between all divisions is essential if the campaign work is to be conducted with vigor and success. By referring once more to Figs. 2 and 3, it will now be seen that the different influences brought to bear on the consumer are allotted to special divisions. In addition, the correspondent who handles inquiries, and the estimator who deals with priced quotations and promises of delivery, represent business actually under way. The last two features are more important in firms making specialties to order, such as machinery firms, engineering plants, etc.

41. Divisional Functions.—The publicity division is in charge of an editor, an expert in literary form and in preparing matter for engravers and printers, who also has a close acquaintance with the industry. In his charge is the preparation of all advertising and printed matter, and also of form letters as far as these relate to propaganda. He also publishes the house organ, if there is one, and compiles the books of instructions to salesmen and agents, in which are set forth the arguments to be used and the objections usually met, with suggestions for overcoming them. The cooperation between the publicity editor and the field superintendent must be exceed-

ingly close, as on these two officers will rest the burden of bringing influence to bear on the customer, in every possible

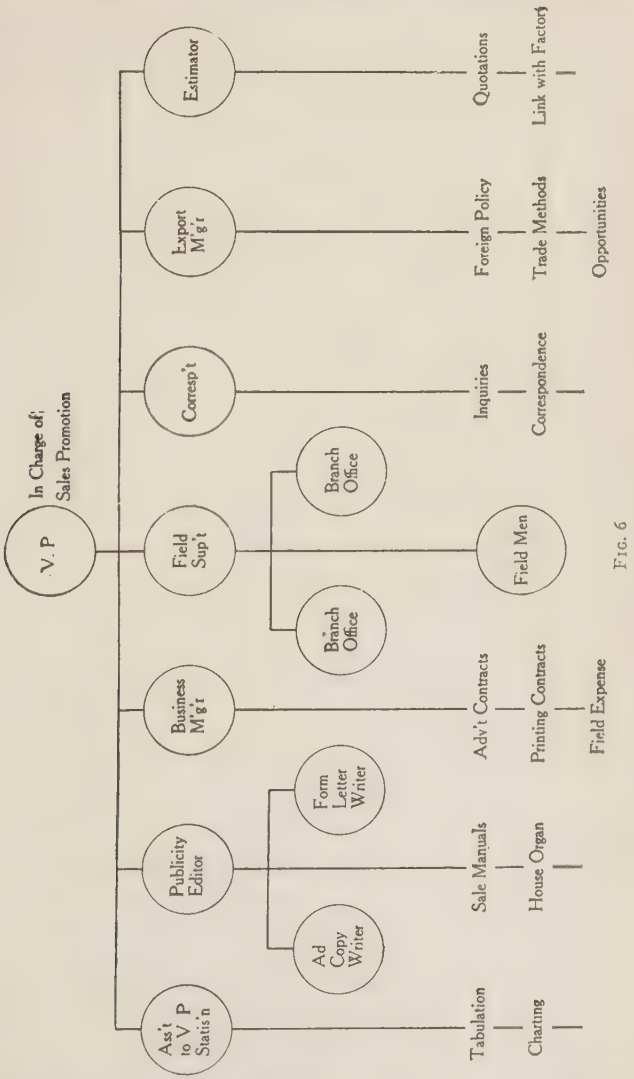

FIG. 6

form. The work of the business manager is self-explanatory. In a small firm his work would be undertaken by the vice-

president. The field superintendent has sole responsibility for all outside propaganda work. He engages and controls the field men or travelers, oversees branches, and supervises agencies. The correspondent handles incoming inquiries and, in conjunction with the estimator, makes quotations to customers. The estimator should be a technical man in close relation with the factory. He prepares quotations, and ascertains probable dates of delivery. He forms the link between the selling department and the plant.

42. Field Superintendent's Division.—Among the principal routine duties of the field superintendent will be that of arranging the work of the traveling salesmen. This may be considered under three heads, namely, training, routing, and quotas. The general principles of the selection and training of salesmen have already been discussed, but something may be said here as to specific methods. The idea on which all such work is founded is that of averages. In an extensive business it will be found, after some experience, that situations tend to recur. The arguments found successful with one customer will be found to apply with equal success to others. Similarly, it will be found that the objections raised in one quarter will be repeated in other quarters, and if successfully countered in one place can be so countered in another. Having found this out experimentally, it has occurred to many sales managers to take advantage of it by reducing to writing all the arguments found most successful and all the objections usually met with, and their proper rebuttal. In this way a valuable body of information is collected that can be used to great advantage in training salesmen.

43. Sales Manuals.—The **sales manual** embodies the information collected about the reaction of the customer to the propaganda. The arrangement of such a manual requires considerable care. A logical order should be adopted, leading from the more elementary situations to those of less frequent occurrence, but specifying in each case when and where each argument may be expected to be most use-

ful. In some cases an attempt is made to make the sales manual cover much more than this. It may begin with information about the firm, and the way in which the product is manufactured. Then it will take up, one by one, the salient points of the product as they should be demonstrated to the customer. This may be followed by the argumentative section already spoken of. Frequently it will be found desirable to include a brief and condensed course of salesmanship, showing how to approach the customer and to arouse his interest; when not to press him; when to close the order; and setting forth the rules and regulations of the firm as regards the routine reports, expense accounts, etc., of the individual salesman. Manuals of this kind will hardly convert a poor salesman into a good one, but they will give all, good and poor alike, the best possible groundwork on which to erect a good record. It will be readily understood that a great deal will depend on the manner in which the manual itself is prepared. While the information should be derived from the field superintendent in cooperation with his staff, the composition and arrangement should be entrusted to the publicity editor, or some one whose business it is to put ideas into print.

44. Routing.—To cover the field satisfactorily, it is necessary, first, to locate the customers, and then to arrange that they, or the most accessible of them, shall be included in the regular journey of salesmen. The use of large-scale maps is indicated for this purpose. Such maps should show the towns and also all railroads, trolleys, automobile roads, and other traveling routes. The location of prospects and customers is then indicated by the use of map pins with colored heads. One color represents prospects not yet reached; another, customers in good standing; a third, customers not now doing business with the firm. Then, by means of a cord, fastened to the map by small pins, the salesman's route is laid out, so as to embrace the largest number of customers or prospects with the smallest amount of deviation. Photographs of such maps may be made and given to each salesman concerned; or, if preferred, the route may be reduced to the form of written

instructions. Usually each route will be numbered and referred to by that number. Several such routes may be allotted to one salesman, much as several rural free-delivery routes run out from each post office. In fact, rural route maps of just this character are issued by the post office. Their scale is, however, too large for this commercial use. Maps specially prepared for such work can be obtained on the market.

45. Quotas.—The **quota** is a standard of performance. It represents, in effect, the budget principle applied to forecasting probable sales. First, a probable total of sales for the next year is assigned for the whole organization. Next, this total is analyzed into its component parts, each such part representing a territory or other regular division of the field. Finally, the territorial total is divided up among the individual salesmen, so that each is assigned a definite value of sales which he is expected to attain or nearly attain in the course of the year. The idea is to set a pace. Frequently this principle is combined with competitions for prizes, or simply for the blue ribbon of salesmanship. The quota system applied to collections for the Red Cross, to subscriptions for Liberty Bonds, etc., was made very familiar to the public during the World War. Each town or city prided itself on oversubscribing its quota. It will easily be understood how, under the proper leadership, such a method can be used to stimulate salesmen, and put interest into their work. The setting of quotas is based upon previous records of sales, and will therefore follow the usual course of business. It may be seasonal, or progressive throughout the year.

46. Export Manager.—The export division will be necessary only in concerns that operate in foreign countries. The size and importance of the division will be in proportion to the amount and variety of such business. The export manager must have special qualifications. Where business is localized, as, for example, with Spanish America, he should be a linguist at least to the extent of being able to read fluently in the foreign language. For correspondence he should be

assisted by a native correspondent where possible, as it is rare for an American to master a foreign language with sufficient success to express himself in writing as freely as one to whom that language is native. Mistakes are likely to occur in quotations and contracts where home-grown talent is left to wrestle with foreign idioms. The export manager should, furthermore, have a close acquaintance, from practical experience, with the course of foreign trade. He should preferably have resided in the country with which business is done. He must be familiar with the proper methods of packing for foreign shipment, know all about the custom-house regulations of each country, the regulations as to invoicing, the rise and fall of exchange, and, generally speaking, the whole method of doing business, which in most foreign countries is very different from that obtaining in the United States. In a large business, some of these matters will be delegated to sections of his division. He should also be on the alert for special opportunities, and know all the government and other channels through which such information can be obtained.

47. Estimating.—The work of the estimating division will vary in importance according to the class of business. It will attain its greatest development in engineering firms, where orders are highly individual; and even where standard machines form the main business, special attachments, modifications, and changes in detail will necessitate close figuring before a firm price can be quoted to the customer. Where only standardized articles are made, the estimating division will be absent, since the necessary figuring on new designs will be undertaken by the producing department, and the selling price of the new line will be settled by consultation between the producing and sales departments. In those cases in which an estimating division is attached to the sales department, it will form a connecting link between that department and the plant. Estimating is highly technical work, and the estimator must be thoroughly familiar not only with the class of business done, but with the actual methods of manufacture in the plant. To him will be referred the technical part of all

inquiries, and he will, after consultation with the producing department, fix the date of delivery to be promised to the customer.

48. Routine of Estimating.—The basis on which good estimating rests is an accurate record of costs of previous work containing the same elements as the job being figured on. The estimator, therefore, must have access to the cost records and must possess a thorough understanding of the way in which they are compiled, particularly as to the manner in which overhead expense is charged on each class of work. But he is not concerned with past history alone. As his work is to give prices for future work, he must keep posted on all changes of wages likely to affect cost of production. He must also be in close touch with the market prices of the principal raw materials that bulk largely in the product, as, for instance, the price of pig iron in foundry work, or steel in construction work. In this connection his relations with the purchasing department should be close and cordial, so that he may be able to avail himself of the information as to proximate changes in prices which it is the duty of that department to study. When a price is to be made by the sales department, the estimator's O. K. on all figures, drawings, and blueprints should be obtained before the bid is officially made. He should also pass on any promise of delivery made in connection with a bid.

THE EXECUTIVE AND CONTROL OF SALES

49. Statistics, Reports, and Charts.—In a large business, with an extensive sales organization, a very considerable number of points have to be watched, and progress of many operations observed from month to month. In the present Section attention will be confined to a consideration of such control devices as pertain to the executive's outlook on the sales situation. As in other cases, he will be concerned not so much with details as with broad results and trends. The executive's interest in the work of the sales organization may be regarded under four heads, as follows: (*a*) Campaign

expenditure and its results; (*b*) unit cost of doing business; (*c*) progress made in covering field; (*d*) degree to which customers are being held and developed. These several points will be dealt with in the following articles.

50. Tabulating-Machine Statistics.—In any large sales organization the statistical information required will be very burdensome unless some mechanical method of working up the figures is resorted to. It is therefore desirable that every transaction should be recorded in such form as to be easily transferred to a tabulator card. The actual details to be punched on the card will vary with each business, but in nearly all cases at least the following data will be required about each sale:

Date. Day, month, year.

Customer's reference number. This will also indicate territory and route.

Salesman's number.

Class of goods, where more than one kind is sold.

Stock number of pattern.

Size and other identification.

Number of items sold.

Weight sold, if sold by weight.

Gross sale price.

Net sale price, after discount.

Cost price.

Credit allowed (number of days.)

If these facts are recorded on a tabulating card as soon as the transaction is closed, a great variety of groupings can be sorted out by the machine, from examination of which important deductions can be made.

51. Working Up Statistics.—Before proceeding to the consideration of the information to be put before the executive, it may be well to enumerate briefly some of the returns and statistical tables that can readily be prepared for the use of the sales department by the aid of the tabulator, provided the original facts have been correctly punched on the cards, as mentioned in the preceding article. Among the

tabulations thus prepared may be data shown in the accompanying table:

Classification	Nature of Information
All territories	Total sales of each class of product. Total gross profit on each class of product. Number of articles sold in each class. Weight sold in each class.
Each territory separately	Same information as above.
Classification by size or stock number	Same information as above, but more fully subdivided by sizes or stock numbers.
Classification by salesmen	Quantity, weight, and value sold, and gross profit made by each salesman. Further classified by classes of goods, if required.
Classification by customers	Purchases of each class for any period. Total amount of purchases over any period. Profit to firm.

Other groupings may be extracted, if required, but those indicated will suffice to show the importance of the tabulator method to a sales organization.

52. Campaign Expenditure and Return.—In entering on a campaign, the amount to be expended should be determined in advance. At the same time a careful study of the probable or expected return should be made, based on previous experience or on expert opinion. Fig. 7 shows a chart that may be used for plotting these data, and also for recording actual results. It should be noted that this is a cumulative chart. The reading plotted for any month is the

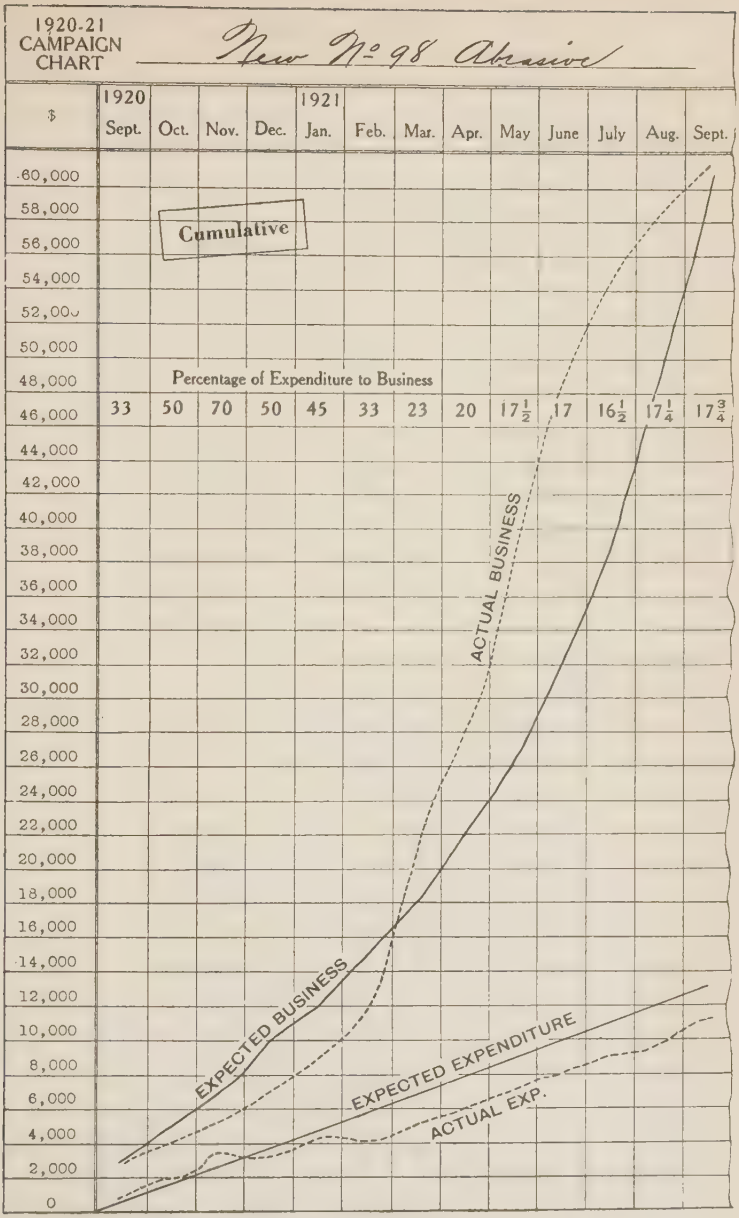
1920-21 CAMPAIGN CHART
New No. 98 Abrasive
$
1920
Sept.
Oct.
Nov.
Dec.
1921
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
60,000
58,000
56,000
54,000
52,000
50,000
48,000
46,000
44,000
42,000
40,000
38,000
36,000
34,000
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Cumulative
Percentage of Expenditure to Business
33
50
70
50
45
33
23
20
17½
17
16½
17¼
17¾
ACTUAL BUSINESS
EXPECTED BUSINESS
EXPECTED EXPENDITURE
ACTUAL EXP.

FIG. 7

total to date, and not merely the value for that individual month. Thus in April, the expected business will be seen to chart at $22,000. This is not the amount of business anticipated for the month of April, but the amount anticipated for the entire period since the beginning of the campaign to the end of April. The total expected business is $60,000, which should be realized by September. Below the curve so obtained is plotted a second curve for the predetermined expenditure. This is seen to amount to $13,000 by September. Both of these curves are laid out before setting the campaign in motion. A chart of this kind can embrace the whole of the work of the campaign, and other similar charts can be set up to record subdivisions. But this can only be done when the amount of business attributable to each subdivision can be traced to its source. Thus, one such chart might be devoted to the expenditure on trade paper advertising and its returns. A similar chart would then be devoted to all other sources and a third chart would combine the figures of these two.

53. Plotting the Results.—From month to month, as the results are ascertained, the corresponding figures are plotted, cumulatively, on the chart. In Fig. 7 the dotted lines represent the actual transactions. It will be noticed that at first the campaign fell behind expectations. This continued until the end of February. Thereafter matters mended and the results were in advance of expectations. Finally, by the month of September, expectations and actual results came out about even. Across the upper end of the chart are given figures representing the percentage (cumulative) of expenditure to business done. In November this ratio was as high as 70 per cent. Thereafter it declined to 17.75 per cent. A study of the chart reveals that in December the rate of expenditure was checked, but it increased again slightly in January, fell off in February, and thereafter continued normal, as indicated by the fact that the dotted line runs nearly parallel to the solid line. But, owing to the holding up of the expenditure in the months of December and February, the total expenditure has been less than originally planned. A chart

of this kind (and, indeed, almost any business charts) is intended, not to be read as a mere historical record of the past, but to be consulted month by month, when the month's figures are freshly entered. It is as a guide to action that such charts are valuable. It may be supposed that the reduction in expenditure in December was effected in this way, in response to the warning indications of the chart at the time.

54. Unit Cost of Inquiries and Orders.—Inquiries being on the one hand the result of an advertising campaign, and on the other the raw material of orders, it is necessary for

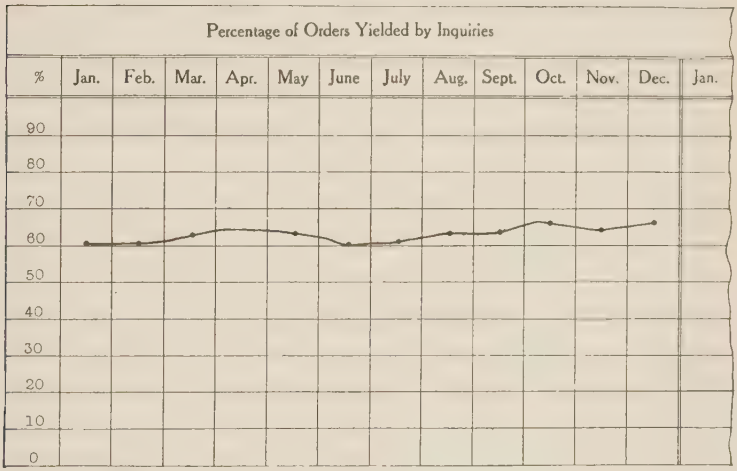

FIG. 8

the executive to keep watch on the unit cost of inquiries, and then on the extent to which such inquiries are turned into actual business. Further, the unit cost of orders should also be charted. If an advertising campaign up to a certain date has cost, say $1,200, and has yielded 1,500 inquiries, the unit cost is 80 cents per inquiry. Now, if 10 per cent. of such inquiries yield business, the unit cost per order, from that particular expenditure, is $8. If 60 per cent. yielded business, then the unit cost of an order is only $1.33. These figures should be charted each month, as the campaign progresses. Fig. 8 shows a chart of percentages of inquiries

yielding orders. As shown, the chart is cumulative, that is, the percentage is the percentage to date, from the beginning of the campaign. If desired, each month's percentage may also be charted on its own merits. The chart shows a fairly uniform average of 60 to 65 per cent. of inquiries being turned into actual business.

55. Covering the Field.—A matter that deserves systematic attention on the part of the executive is the extent to which the known field is being covered. This is a point that is very apt to be overlooked where a thriving business is being

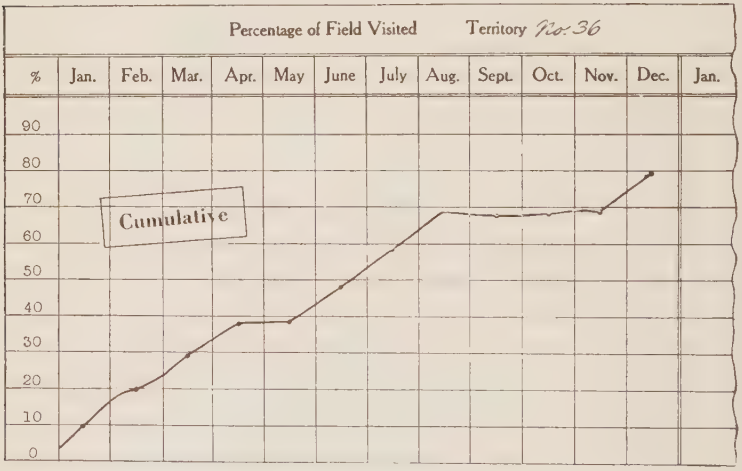

FIG. 9

done. Before such a matter can become the subject of investigation it is obvious that a geographical survey of the sales situation must have been made, as suggested in former articles. But when the extent of the field, that is, the number and location of possible customers, has been determined, then it becomes of importance to ascertain, from time to time, just how much of this field has already been covered and how much is as yet unworked. Travelers' reports are noted on the field or territory lists, and names are marked off as visited. Then each month these lists are gone over by the statistician, and the ratio of firms called on to the total number in the territory

is found and entered on a chart such as that shown in Fig. 9. This chart is cumulative from the beginning of the year. The chart shows steady progress in covering the field in No. 36 territory until April, then a halt, progress again from May to August, then no progress until November. Up to date (December) 80 per cent. of the field has been covered. Every month the executive will look at the chart, and judge by the shape or direction of the curve whether special measures are needed. He will make his decision in the light of his knowledge of current business; thus, the let-up from August to November, on the chart illustrated, may have been quite within the bounds of propriety, if unavoidable circumstances known to the executive duly accounted for it.

56. Watching Field Quotas.—The extent to which a territory is being covered by the field men is a different matter from the fulfilment of the quotas assigned. In fact, these two things tend, if anything, to work in opposite directions. If the quota is being filled or passed in a territory, the chances are that the field men will not be so alert in covering the unexplored portion of the field in that territory. The chart, Fig. 9, should therefore be placed alongside that shown in Fig. 10, which latter relates to the way in which the quotas are being filled in each main territory or sales district. The chart is cumulative. It therefore indicates, at any moment, the business done since the beginning of the year or season, compared with the expected business. The actual value in dollars of the orders expected and received is shown at the left hand of the chart. The solid line represents business expected, the dotted line business actually done. By reviewing such a chart each month, the executive is able to see at a glance just how matters stand in each sales district. Any variation from expectation, or any sudden change in the curve of actual results, will suggest further inquiry into the case.

57. Variation in Customers' Accounts.—As it costs a good deal to get a customer, it is very necessary to see that he is held, when obtained. This question may be viewed from two aspects, that of averages in any territory, or all territories,

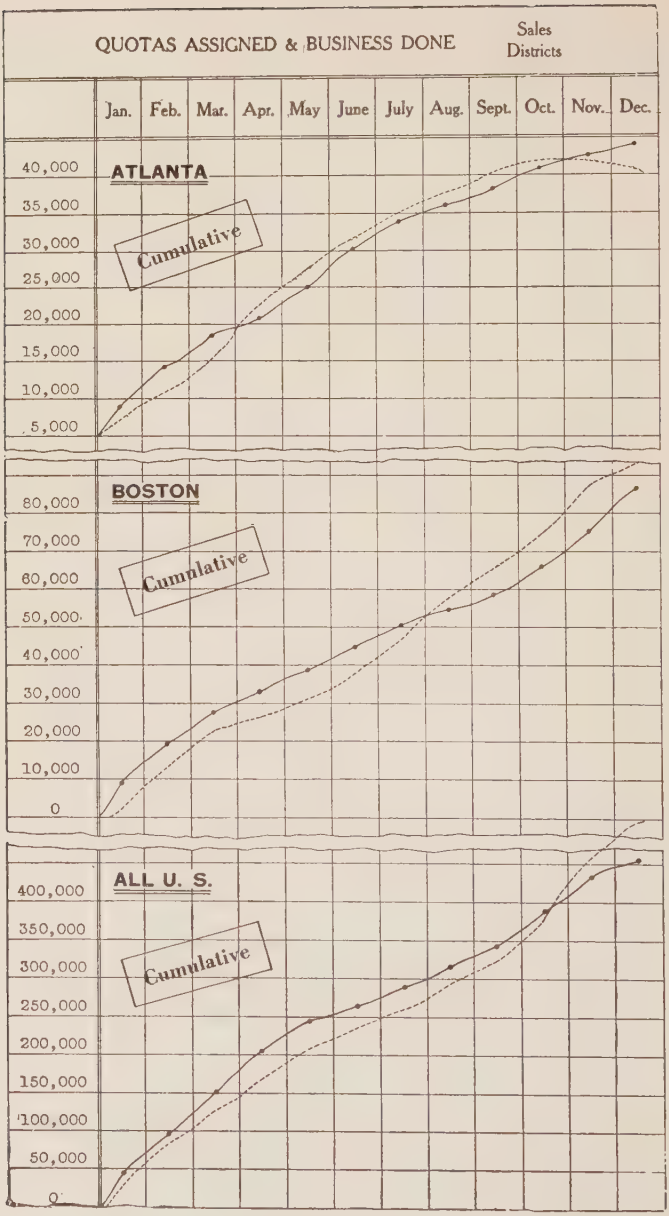
QUOTAS ASSIGNED & BUSINESS DONE
Sales Districts
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.
ATLANTA
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
Cumulative
BOSTON
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Cumulative
ALL U. S.
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Cumulative

Fig. 10

and also that of individual customers. The keeping of a close watch on details like these is not very easy, or rather cannot be lightly undertaken on account of expense, unless the tabulating machine method of working up statistics is in use. When this is the case, the machine will readily sort out the information required for the two charts shown in Figs. 11 and 12. It will be remembered that among the information punched on the tabulator card were: (*a*) identification of customer, and (*b*) amount of sale. It is easy, therefore, to obtain, by machine sorting, the total of business for each customer. Having found this it is an easy matter, again, to mark off on a ruled sheet, in which of several classes the quarter's trading with that customer falls, whether the total amount of orders is below $50, or between $50 and $100, and so on. The limits of the classes will be adjusted to meet the conditions of each business. For some the $50 minimum might be too high, for others absurdly small.

58. Holding the Customer.—The chart in Fig. 11 does not concern the executive so much as the field superintendent. Each chart represents a definite locality or town. As shown, the totals are for a three months' period, but they may be made monthly if desired. A glance at the lowermost curve on the chart shows the general trend of business in the whole locality; above it is seen the representation of the facts regarding individual accounts. Any persistent drooping or sudden stop in a customer's curve will point the need for inquiry. As read from month to month, such charts convey at a glance a bird's-eye view of the situation in each territory.

59. Accounts by Classes.—The same set of facts, put in condensed form and from a somewhat different viewpoint, is exhibited in Fig. 12. Here the growth or decline of the size of accounts is shown. Each chart provides space for four quarterly reviews. Accounts are grouped according to amount of business done in the period. The number of accounts in each class is shown in the left-hand column. Referring to the figure, it will be seen that Denver district shows a satisfactory growth in all classes of accounts. Omaha,

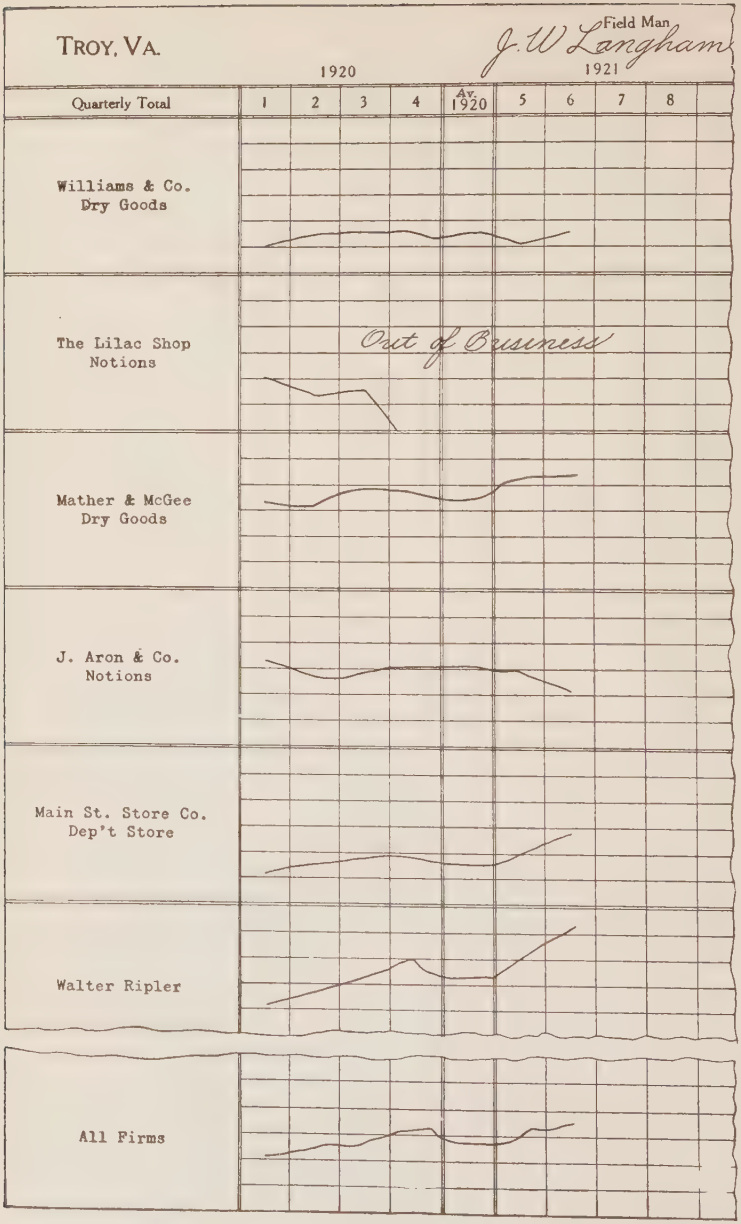
TROY, VA.
Field Man
J. W Langham
1920
1921
Quarterly Total
1
2
3
4
Av. 1920
5
6
7
8
Williams & Co.
Dry Goods
The Lilac Shop
Notions
Out of Business
Mather & McGee
Dry Goods
J. Aron & Co.
Notions
Main St. Store Co.
Dep't Store
Walter Ripler
All Firms

FIG. 11

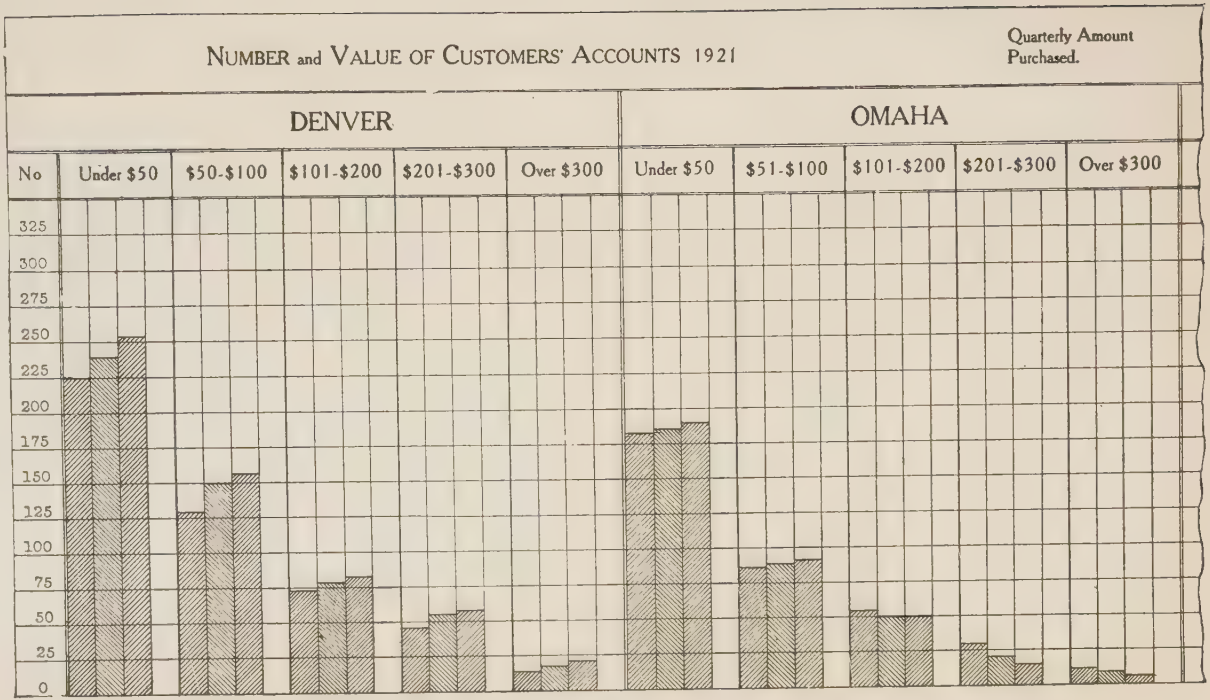
NUMBER and VALUE OF CUSTOMERS' ACCOUNTS 1921
Quarterly Amount Purchased.
DENVER
OMAHA
No
Under $50
$50-$100
$101-$200
$201-$300
Over $300
Under $50
$51-$100
$101-$200
$201-$300
Over $300
325
300
275
250
225
200
175
150
125
100
75
50
25
0

FIG. 12

on the contrary, shows a very small increase in the smaller classes, but a falling off in the larger classes. Observing this, the executive will certainly call for a report from the field superintendent as to the reason for this bad showing.

60. Individual Salesman Efficiency.—Another chart of interest to the field superintendent rather than to the executive is shown in Fig. 13. The readings are cumulative

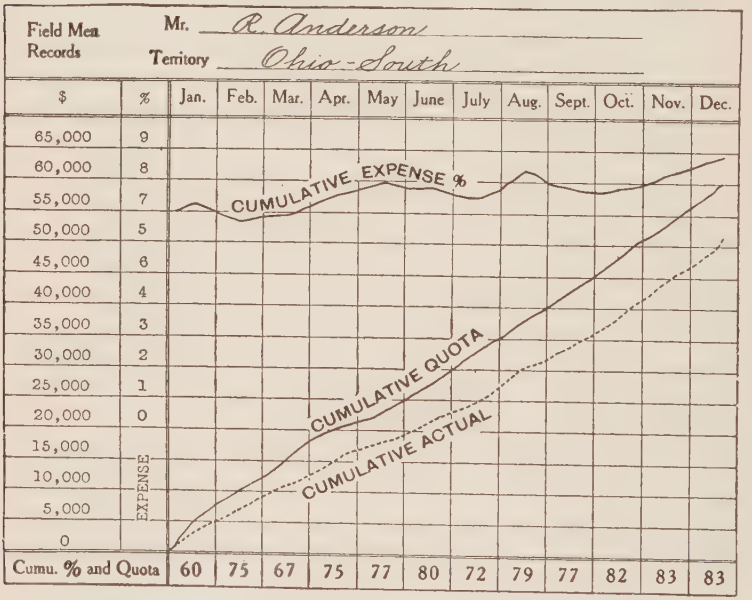

FIG. 13

from the beginning of the year or the season. The chart gives an individual salesman's quota, and also the actual business he has done up to date. (The requisite data are most conveniently collected by the aid of the tabulating machine.) The ratio of his expense account to the business actually obtained is plotted near the top of the chart, and shows a variation between 7 per cent. and 9 per cent. This particular man is running behind on his quota, while his ratio of expense is rising. At the foot of the chart the figures of the ratio (cumulative) of actual to expected business are given.